FOREST HEALTH OF THE UNITED STATES' FORESTS

SECTION #1, PART # 5

GENERAL FIGURES AND TABLES

by the

Forest Health Science Panel

A Panel Chartered
by
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United States Congress

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TABLES:

HOW THE BAR GRAPHS AND RANKINGS WERE DETERMINED

The purpose of these figures and tables is to give a quick grasp of the present conditions of the forest and the effects of different policy options. The tables and figures showing conditions (Figure 1.4) and effects (Figures 1.5, 1.6, and 1.7 and Tables 1.3 and 1.5) should be considered relative and approximate, as should any numbers.

As with any analytical study and scientific research, each condition, effect, and number could be refined. For making decisions, however, the important questions are:

Would refinements of conditions, effects, and numbers change the impacts of different policy options on those values which policymakers consider important?

Are the refinements significant enough to justify the delay while the refinements are made?

The conditions, effects, and numbers described below were developed with substantial care, expertise, study, analysis, and conscientiousness by the Forest Health Science Panel. This panel feels the results are quite robust; however, as with any analysis, the Panel welcomes refinements or critiques done with similar care, expertise, study, analysis, and conscientiousness.

As with any policy analysis, the effects of alternative policy options assume each option is carried out completely. The policymaker must understand that partial fulfillment of a policy option will result in intermediate results.

For example, the United States could avoid being a net importer of wood (or increased consumer of substitute products, with resulting increases of fossil fuels) if it created reserves (areas of no timber harvest) out of half of its current National Forests and increased the intensity of forest management and harvest in the North (Figure 1.1) through either timber management for financial efficiency or integrated management (Policy Options # 2 and #4). If, however, it created these additional reserves but did not increase management and harvest in the North, it would not realize the results of Policy Options #2 and #4--and would become a net importer of wood and/or increased consumer of substitute products.

The Panel will be available if policymakers wish further analysis of alternative or partially fulfilled policy options.

Details of how conditions, effects, and numbers were developed for the tables are described below.

How the potential and realized conditions were developed (Figure 1.4):

Both the potential and realized condition relative to each value were described for each region as "high", "medium", or "low" by the Forest Science Health Panel.[1]

The Panel had assembled information (Appendixes B and C) and had expertise in different subject areas and regions (See Appendix E). Where there was any question or disagreement over rankings, more information and outside expertise was obtained[2]. Increasingly refined information and subsequent consensus was used to resolve questions of rankings; the rankings were not resolved by vote.[3] Developing and refining these rankings took place over many meetings, "FAX's", telephone calls, and letters during many months.

Figure 1.4 shows the rankings for each region developed by the process described above.

The potential and realized conditions for the United States as a whole were developed by weighing each region by land area.[4] Specifically, the "high", "medium", or "low" ranking for each value was converted to numbers[5]; and these numbers were multiplied by the total productive forest area in each region and summed for each value. These rankings are shown in Figures 1.4.

How the effects of each management approach on each value were developed:

The effects of each management approach on each value were similarly ranked as "High", "Medium", and "Low." These rankings can be inferred from Table 1.3.

These rankings were developed in the same manner as they were developed for the "Conditions", described above. The Panel had assembled information (Appendixes B and C) and had expertise in different subject areas and regions. Where there was any question or disagreement over rankings, more information and outside expertise was obtained[6]. Increasingly refined

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[1] These rankings were not intended to be quantitative; however, for development of the charts, they were converted to numbers. For comparison with effects of Policy Options (Table 1.5), they were converted to the numbers: "2=low"; "5=medium", "7=high." For other tables where present conditions were compared among regions and values, the rankings were converted to the numbers "High=1.0, Medium =0.5, Low =0.1." These comparisons are relative and such differences in weighting are not directly compared and so do not impact the analysis.

[2] The Panel is especially grateful to Dr. Jim Patrick, research hydrologist, retired, from the USDA Forest Service for his conscientious input on the water and watershed aspects of this study.

[3] Much more information was consulted than is shown in Appendix F, References. This Appendix only gives sources of information directly cited in the report. Where more information corroborated this information, it was not cited.

[4] Preliminary analysis which attempted to weight regions by productivity (defined by Powell et al. 1993) did not appear to add significantly more information; consequently, this analysis was not pursued.

[5] Described in Footnote #1, above.

[6] The Panel is especially grateful to Dr. Jim Patrick, research hydrologist, retired, from the USDA Forest Service for his conscientious input on the water and watershed aspects of this study.

information and subsequent consensus was used to resolve questions of rankings; the rankings were not resolved by vote.[7] Developing and refining these rankings took place over many meetings, "FAX's", telephone calls, and letters during many months.

How the effect of each policy option on each value was developed:

The effect of each policy option on each value for each region was developed by weighing the effect of each management approach by the amount of land area in each region subjected to that management approach.[8] Specifically, the amount of land area subjected to each management approach within the region was multiplied by the ranking (converted to numbers, described above) and summed for each region. Figures 1.5, 1.6, and 1.7 and Table 1.3 show the rankings for each region developed by the process described above.

The effects of each policy option on the United States as a whole were developed by summing the ranking of each value weighted by its land area. Specifically, the amount of land area subjected to each management approach within the total United States was multiplied by the ranking (converted to numbers, described above) and summed for each region. Table 1.5 and Section #2 show the rankings for each region developed by the process described above.

How the quantitative effects of each management approach and policy option on selected values were developed:

For some values, it was possible to obtain quantitative assessments of the effects of each management approach on each value. Different sources varied in their quantitative estimates of such things as amount of net exports and imports; employment in the forestry and forest products industries; and costs, returns, and employment under different management approaches. Some of the estimates are shown in Appendix C. The quantitative estimates used in this paper are shown in Table 1.6. Because of these variations, it is possible to obtain different quantitative results of the effects of different management approaches and policy options. The numbers shown in Tables 1.3 and 1.5 and Section #2 should be used for comparison purposes only.

The quantitative estimates of the effect of each management approach applied to the entire United States are shown in Table 1.3. The numbers were obtained by multiplying the values in Table 1.6 by the land area (and/or average growth rates for each region where appropriate) and summing them.

Quantitative estimates of the effect of each policy option on each value for each region and the United States was obtained by multiplying the effect of

[7] Much more information was consulted than is shown in Appendix F, References. This Appendix only gives sources of information directly cited in the report. Where more information corroborated this information, it was not cited.

[8] For comparison purposes, the rankings were converted to the numbers "High=1.0, Medium =0.5, Low =0.1."

each management approach by the land area (and/or average growth rates by region where appropriate) under this management approach for each option, and summing the results for each value by region and the United States. These are shown in Table 1.5 and Section #2.

FIGURE 1.1. THE UNITED STATES WILL BE DIVIDED INTO FIVE REGIONS FOR THIS REPORT. (Regions correspond to Powell et al. 1993).

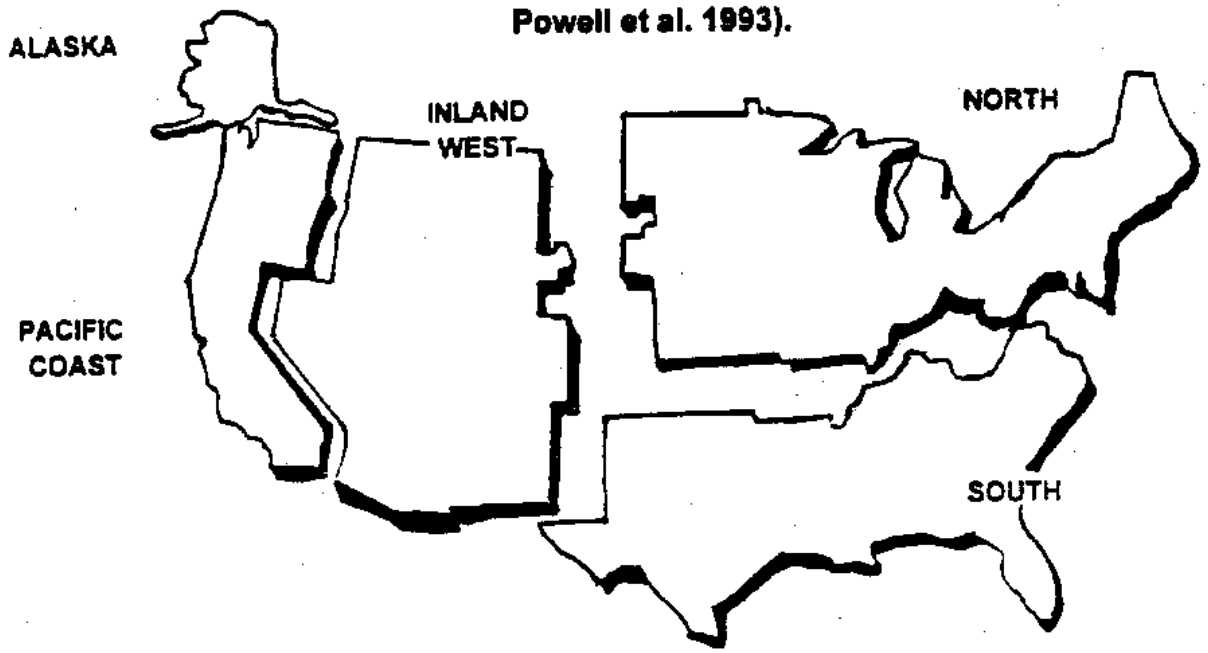
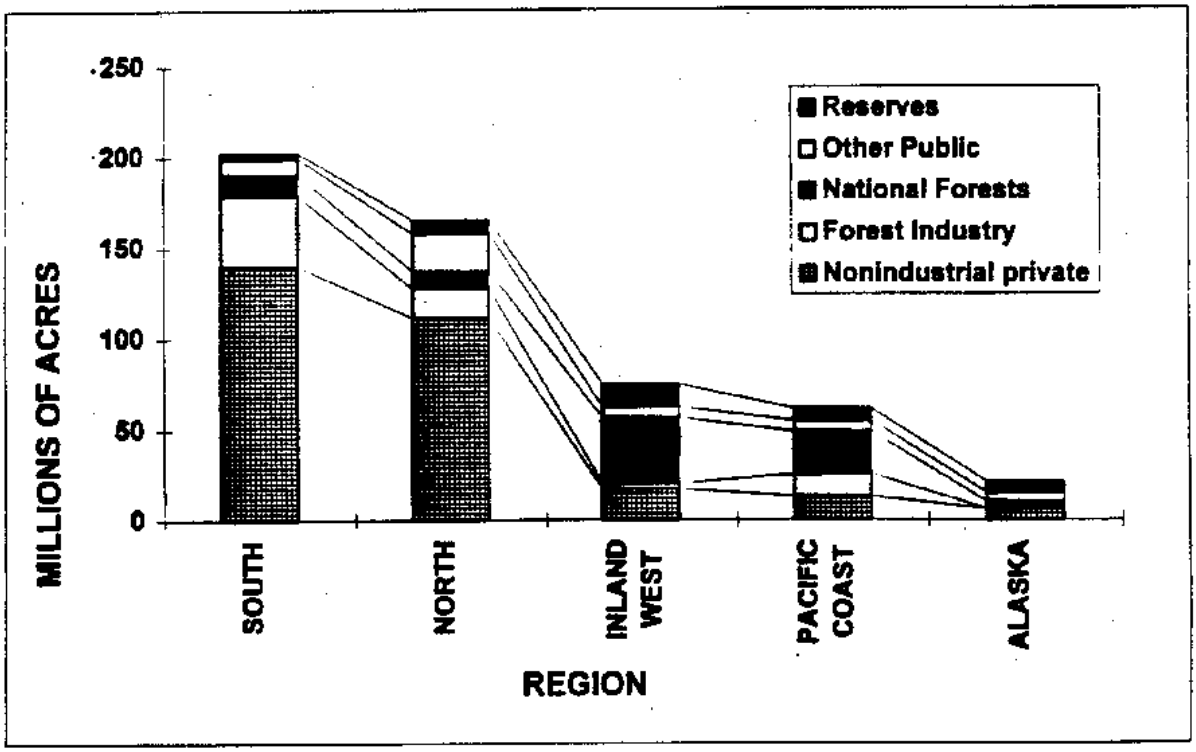


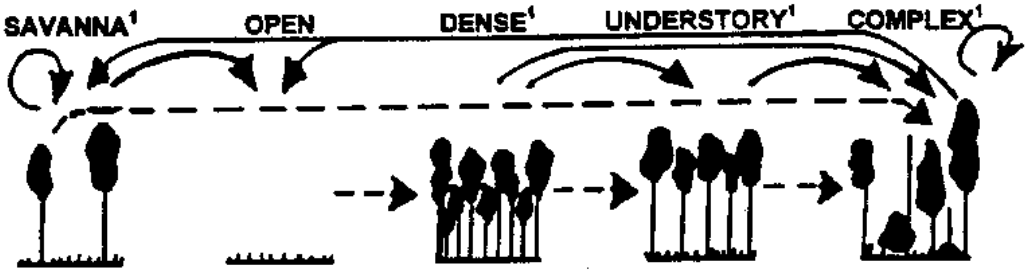
FIGURE 1.2. DISTRIBUTION OF PRODUCTIVE FOREST AREA BY REGION AND OWNERSHIP.



THE UNITED STATES' FORESTS ARE NOT EVENLY DISTRIBUTED AMONG REGIONS BY AREA OR OWNERSHIP.

FIGURE 1.3. STAND STRUCTURES AND UTILIZATION BY SPECIES

A. CHANGES IN STAND STRUCTURES FOLLOWING GROWTH (DASHED ARROWS) AND DISTURBANCES (SOLID ARROWS).



B. RELATIVE NUMBER OF SPECIES UTILIZING EACH STRUCTURE.

C. EXAMPLES OF THREATENED, ENDANGERED, OR EXTINCT SPECIES IN EACH REGION WHICH DEPEND ON SPECIFIC HABITATS[2]. (SEE TABLE 1.2).

THE SOUTH		
red-cockaded woodpecker		ivory billed woodpecker
THE NORTH		
karner blue butterfly	heath hen	Virginia northern flying squirrel
THE INLAND WEST		
	grizzly bear[3]	Mexican spotted owl
THE PACIFIC COAST		
Columbian white-tailed deer	lotus blue butterfly	northern spotted owl

1 By various usages, the savanna, dense, understory, and complex structures have each been referred to as "old growth."
2 The authors are grateful to Professor D.A.Maruwal, University of Washington and to Professor J.H.Shaw, Oklahoma State University for their advice. (Other sources were also consulted.)
3 The grizzly bear utilizes these openings for part of the year in the Inland West, but can adapt to some other structures.

FORESTS CONTAINED A VARIETY OF STAND STRUCTURES AS DISTURBANCES AND REGROWTH CHANGED EACH AREA. SOME SPECIES DEPEND ON EACH STRUCTURE (HABITAT), AND THERE ARE THREATENED AND/OR ENDANGERED SPECIES IN EACH REGION (EXCEPT ALASKA) WHERE THERE IS A SHORTAGE OF "SAVANNA" OR "OPEN" AS WELL AS "COMPLEX" HABITAT.

FIGURE 1.4.1A. POTENTIAL TO ACHIEVE AND EXTENT ACHIEVING FOREST CONDITIONS--NATIONAL.
(from TABLE 1.1A)

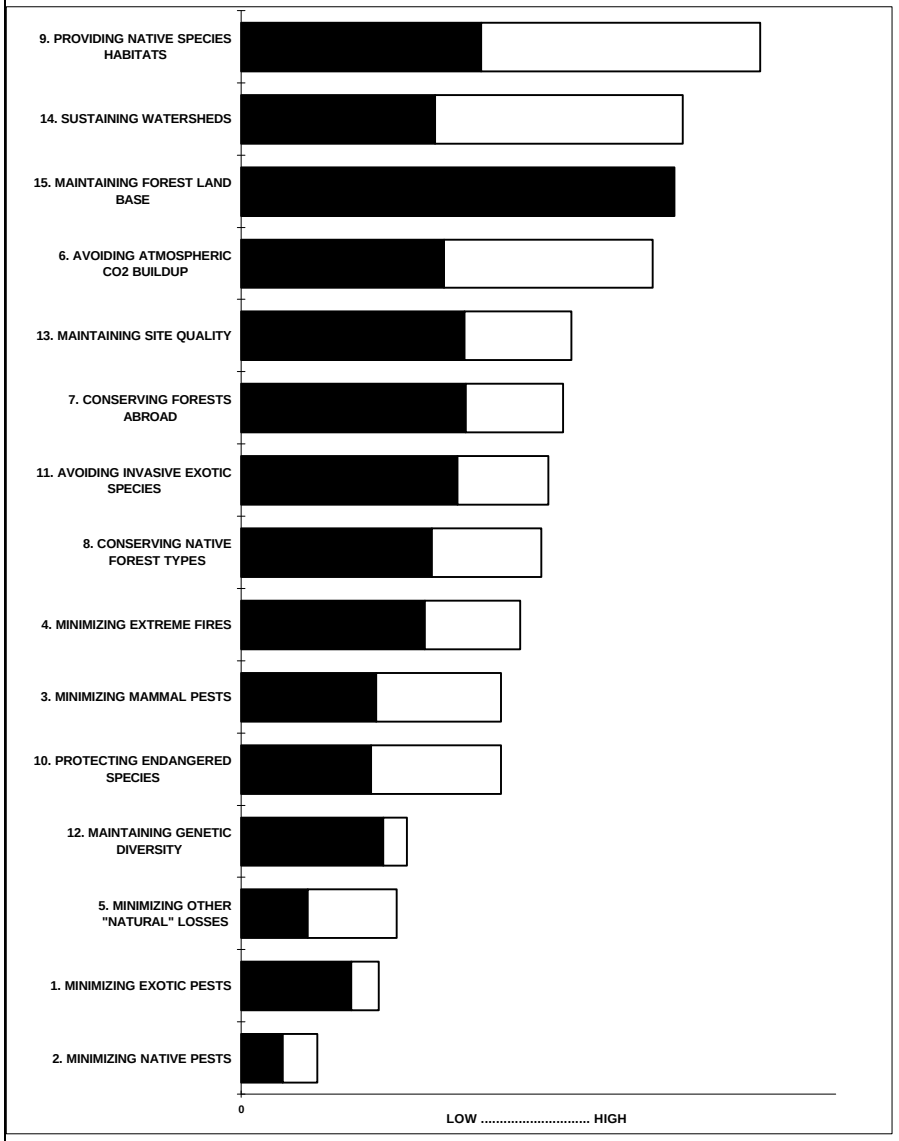
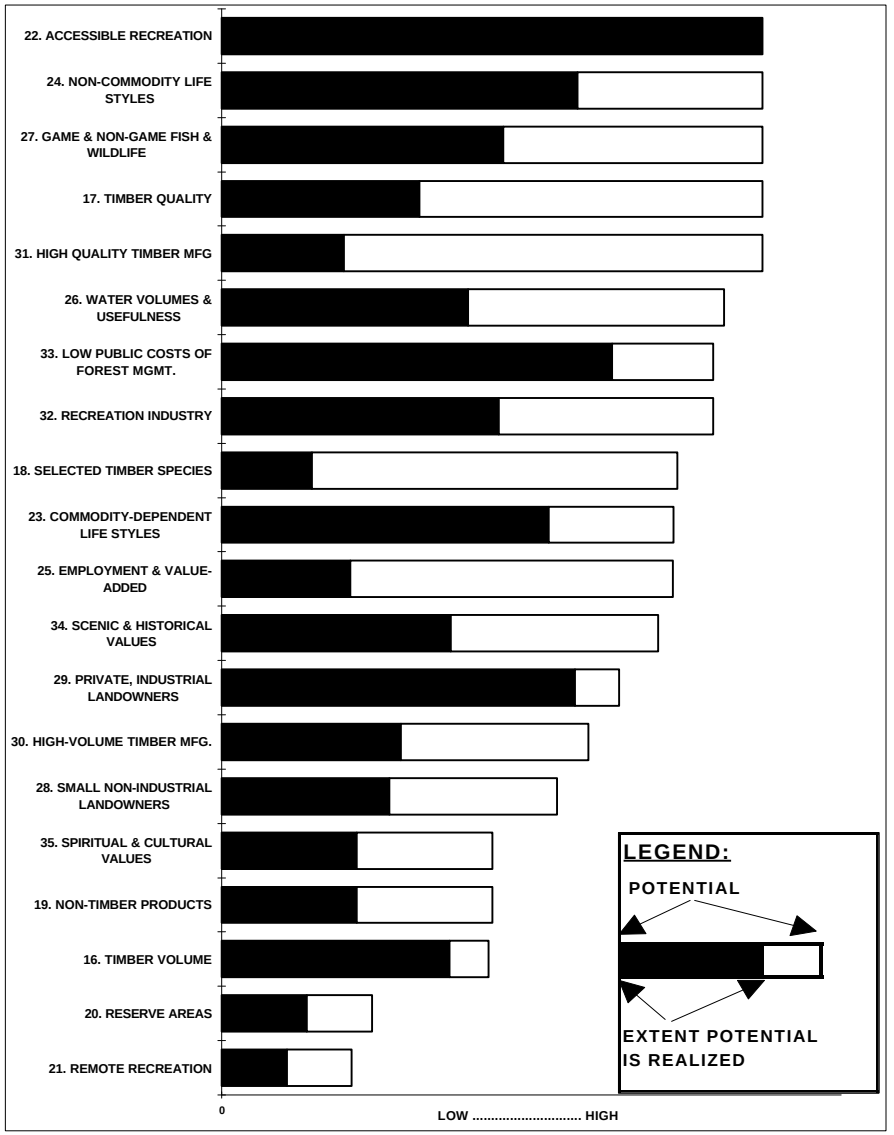


FIGURE 1.4.1B. POTENTIAL TO PROVIDE AND EXTENT PROVIDING CONTRIBUTIONS FROM FORESTS--NATIONAL.
(from TABLE 1.1B)



UNREALIZED POTENTIAL IS SHOWN AS CLEAR PORTION OF BARS; RANKED BY POTENTIAL.

FIGURE 1.4.2A. POTENTIAL TO ACHIEVE AND EXTENT ACHIEVING FOREST CONDITIONS--SOUTH.
(from TABLE 1.1A)

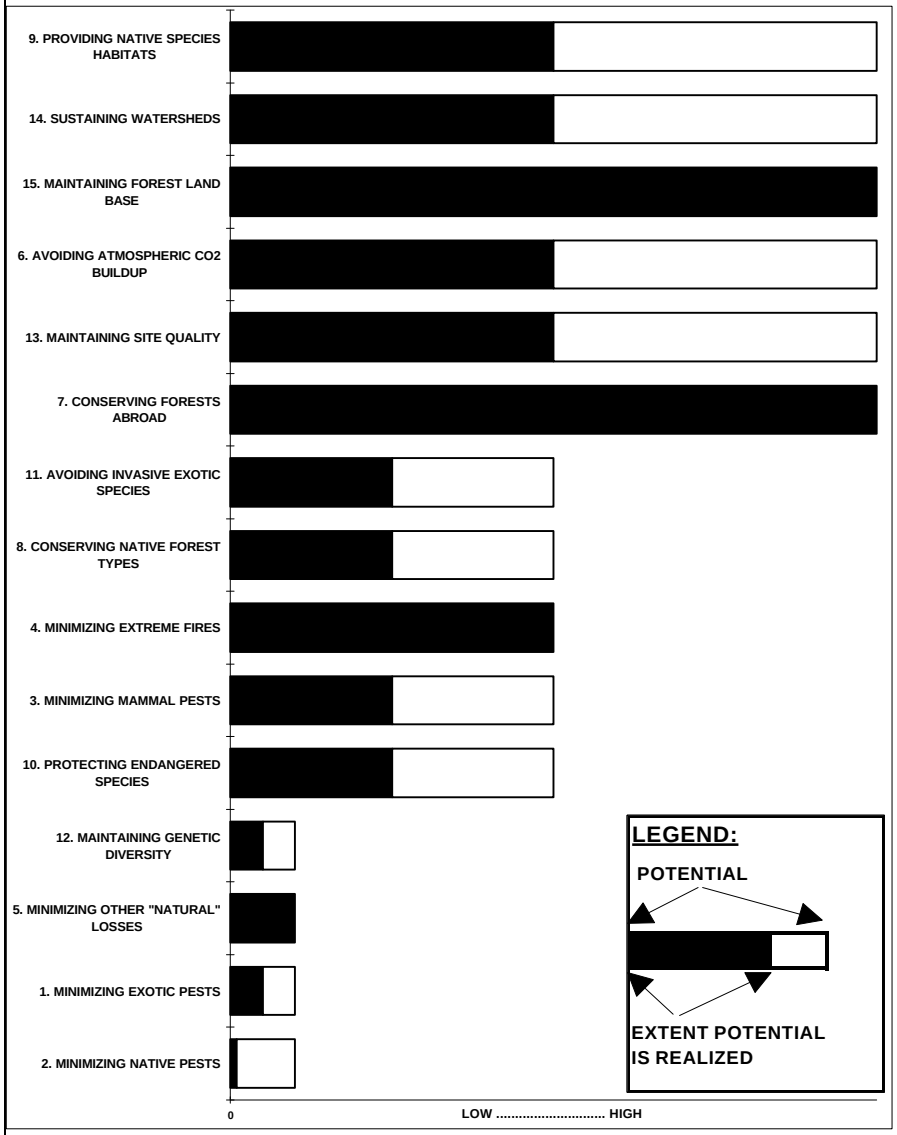
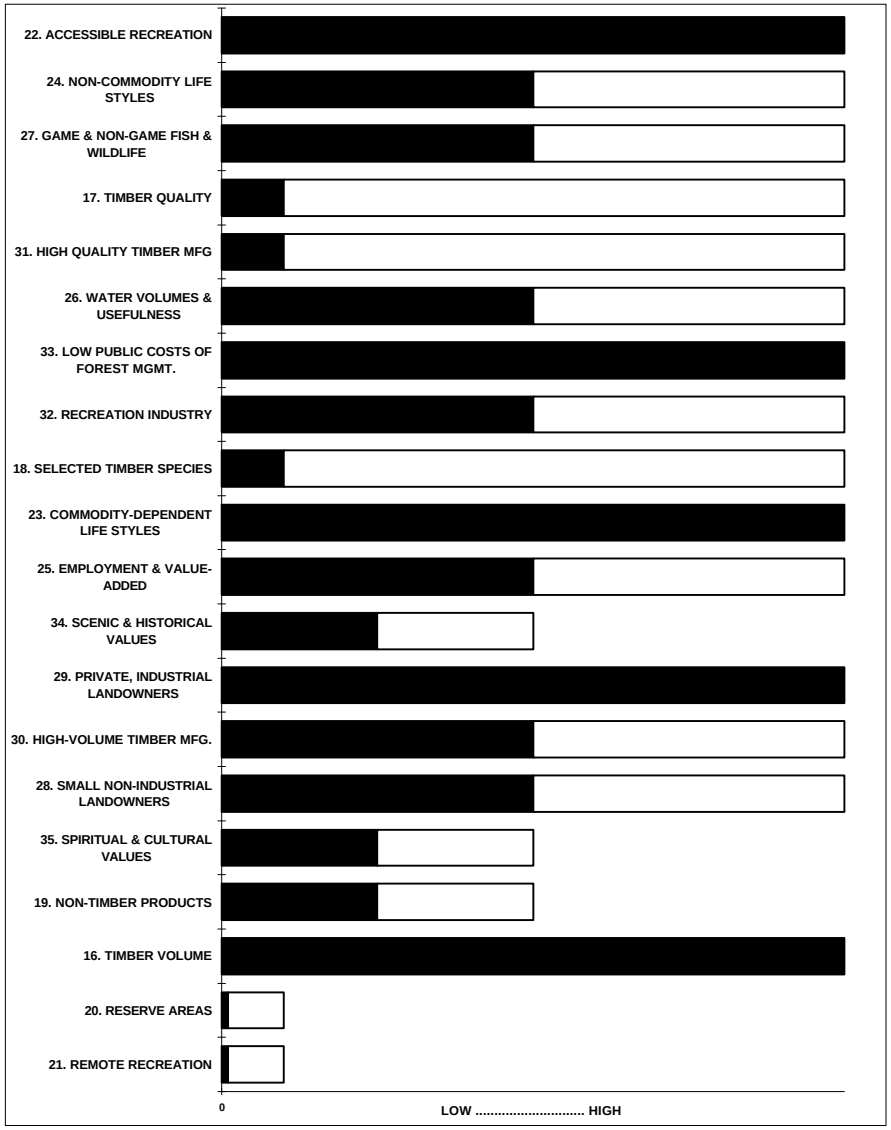


FIGURE 1.4.2B. POTENTIAL TO PROVIDE AND EXTENT PROVIDING CONTRIBUTIONS FROM FORESTS--SOUTH.
(from TABLE 1.1B)



UNREALIZED POTENTIAL IS SHOWN AS CLEAR PORTION OF BARS; RANKED BY NATIONAL POTENTIAL (FIGURE 1.2.1A&B).

FIGURE 1.4.3A. POTENTIAL TO ACHIEVE AND EXTENT ACHIEVING FOREST CONDITIONS--NORTH.
(from TABLE 1.1A)

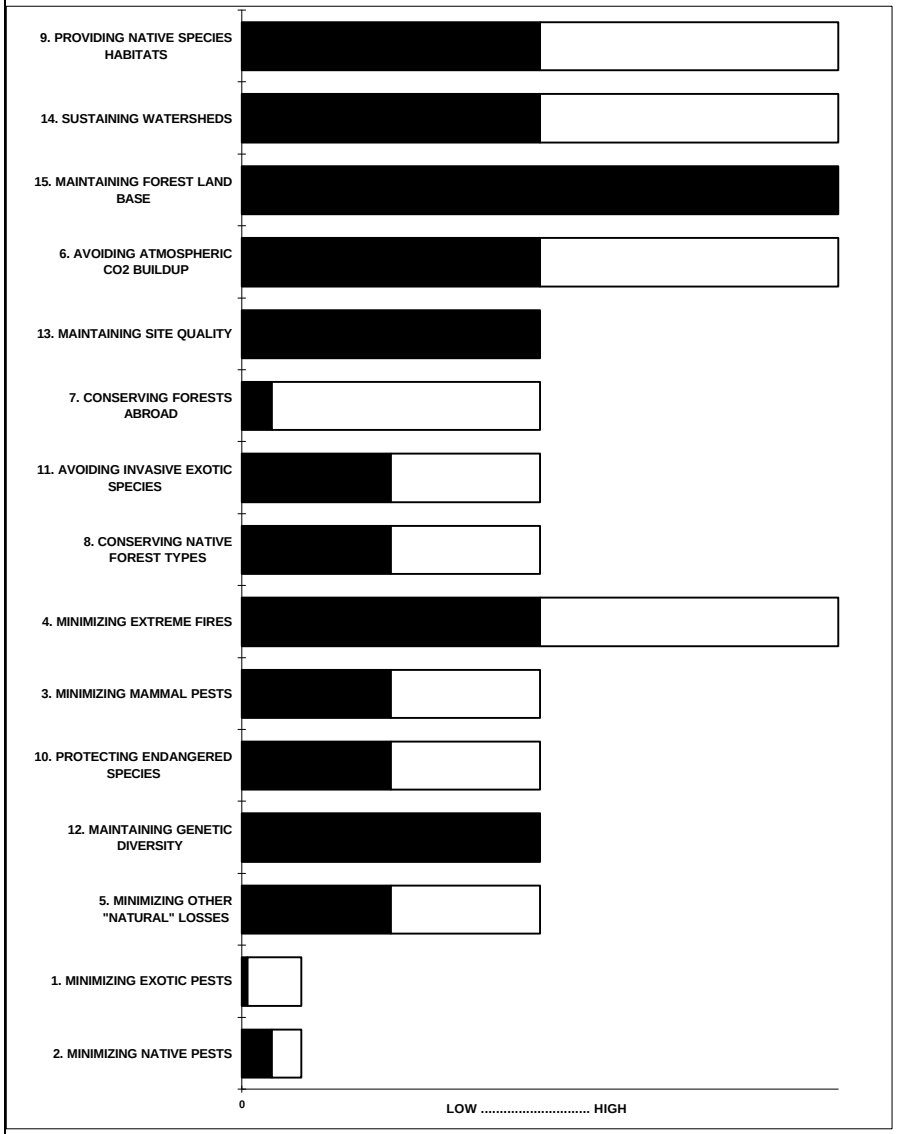
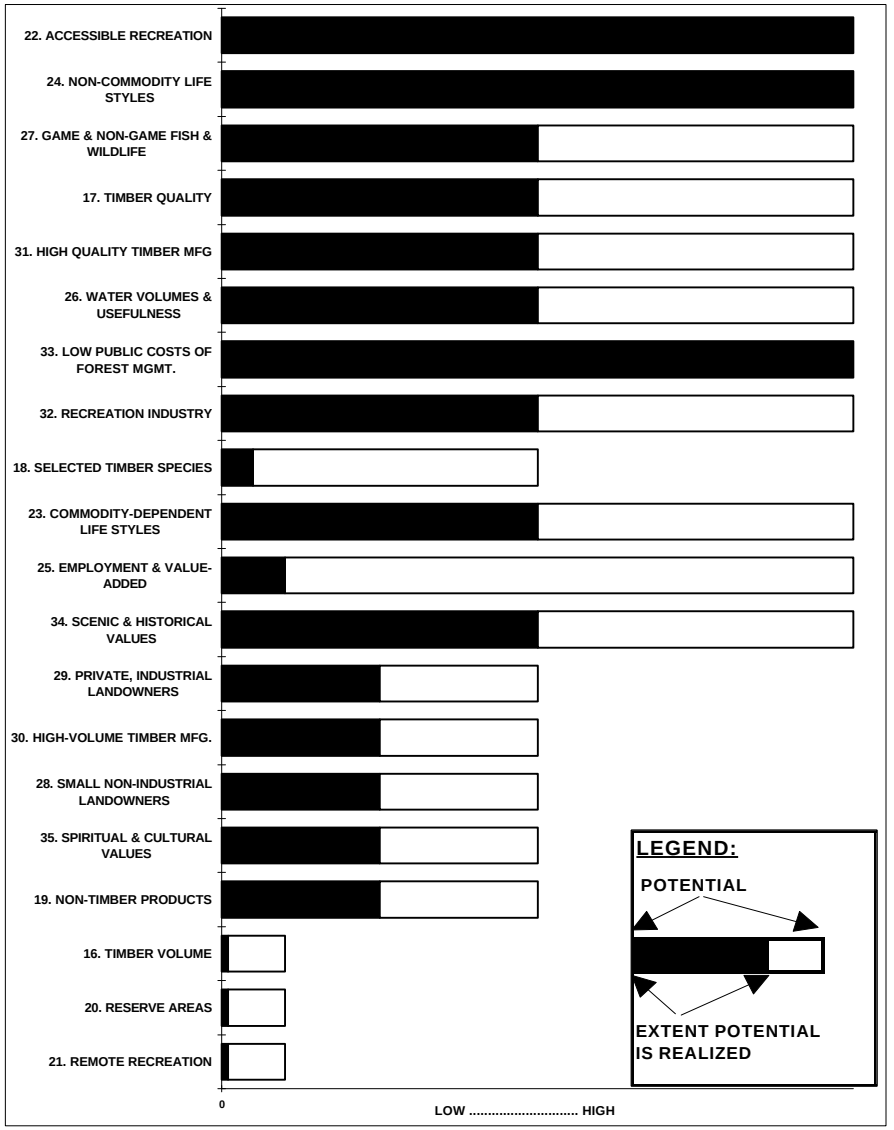


FIGURE 1.4.3B. POTENTIAL TO PROVIDE AND EXTENT PROVIDING CONTRIBUTIONS FROM FORESTS--NORTH.
(from TABLE 1.1B)



UNREALIZED POTENTIAL IS SHOWN AS CLEAR PORTION OF BARS; RANKED BY NATIONAL POTENTIAL (FIGURE 1.2.1A&B).

FIGURE 1.4.4A. POTENTIAL TO ACHIEVE AND EXTENT ACHIEVING FOREST CONDITIONS--INLAND WEST.
(from TABLE 1.1A)

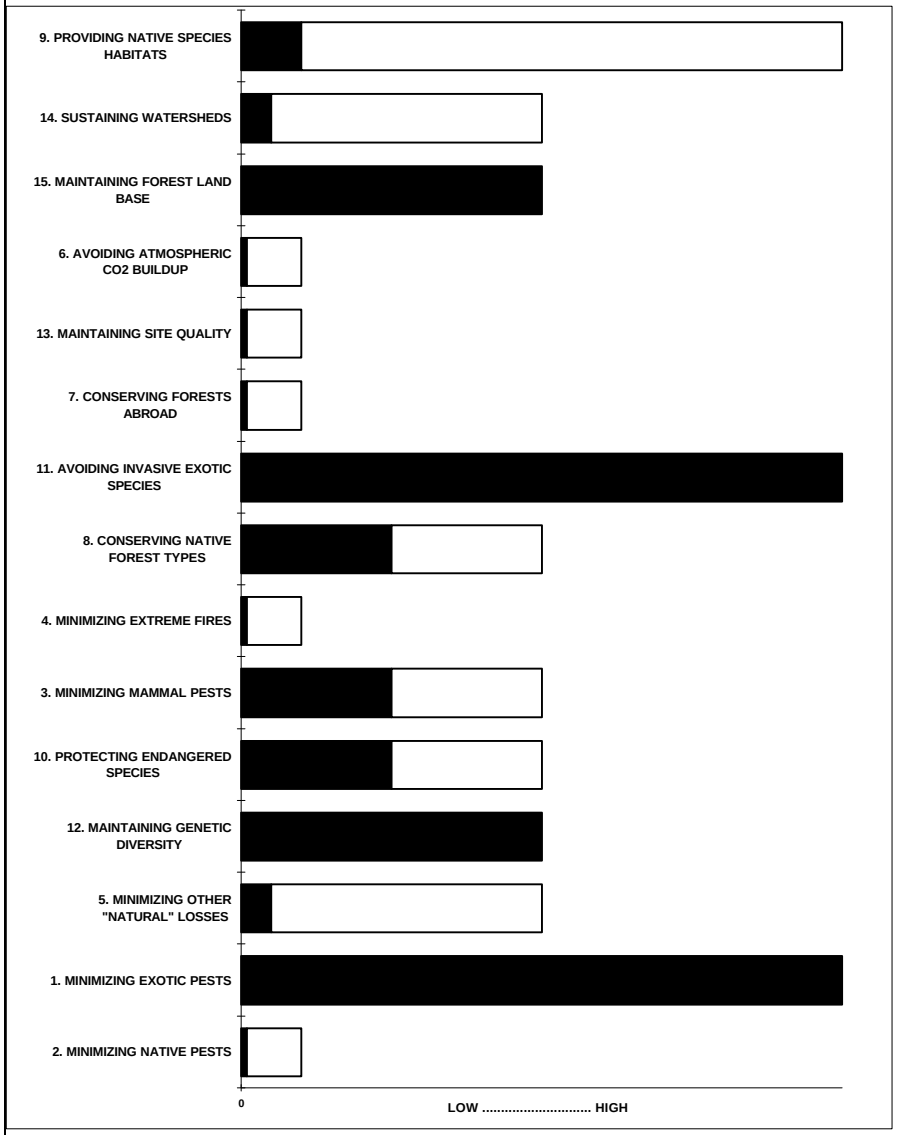
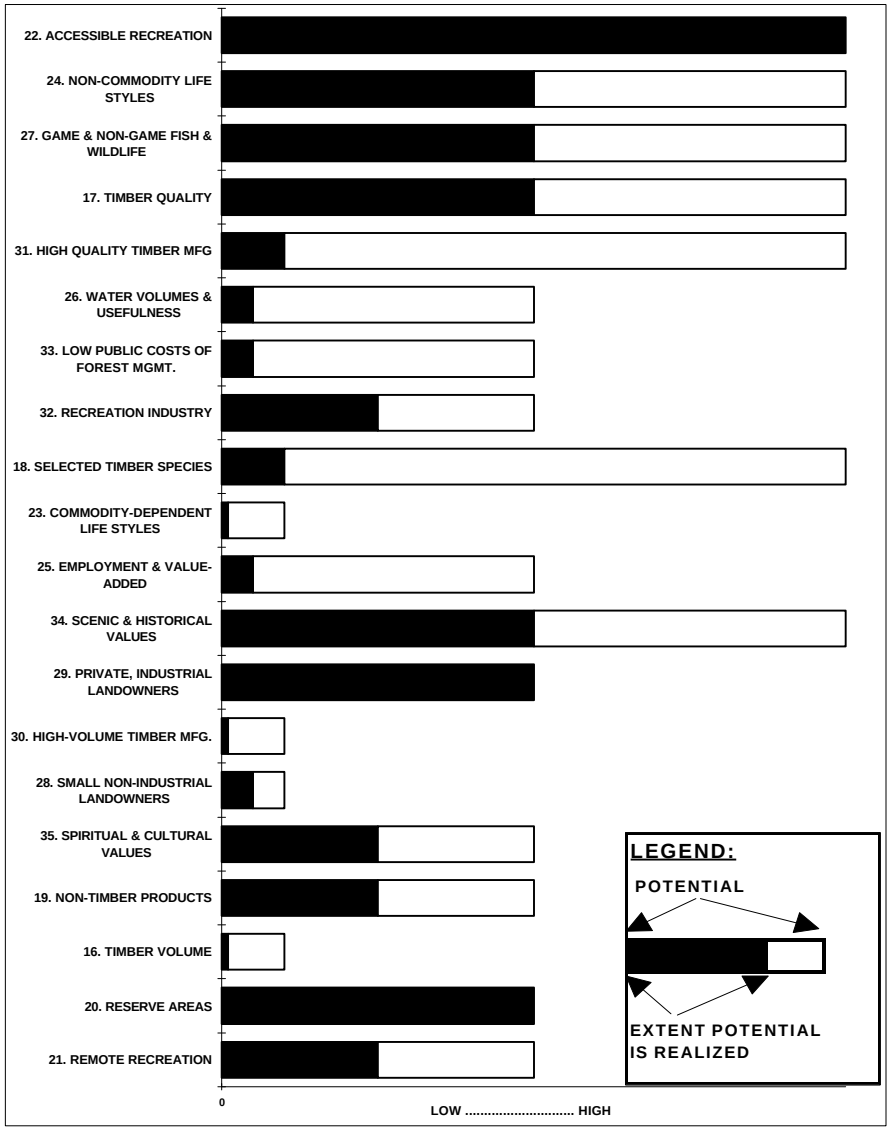


FIGURE 1.4.4B. POTENTIAL TO PROVIDE AND EXTENT PROVIDING CONTRIBUTIONS FROM FORESTS--INLAND WEST.
(from TABLE 1.1B)



UNREALIZED POTENTIAL IS SHOWN AS CLEAR PORTION OF BARS; RANKED BY NATIONAL POTENTIAL (FIGURE 1.2.1A&B).

FIGURE 1.4.5A. POTENTIAL TO ACHIEVE AND EXTENT ACHIEVING FOREST CONDITIONS--PACIFIC COAST.
(from TABLE 1.1A)

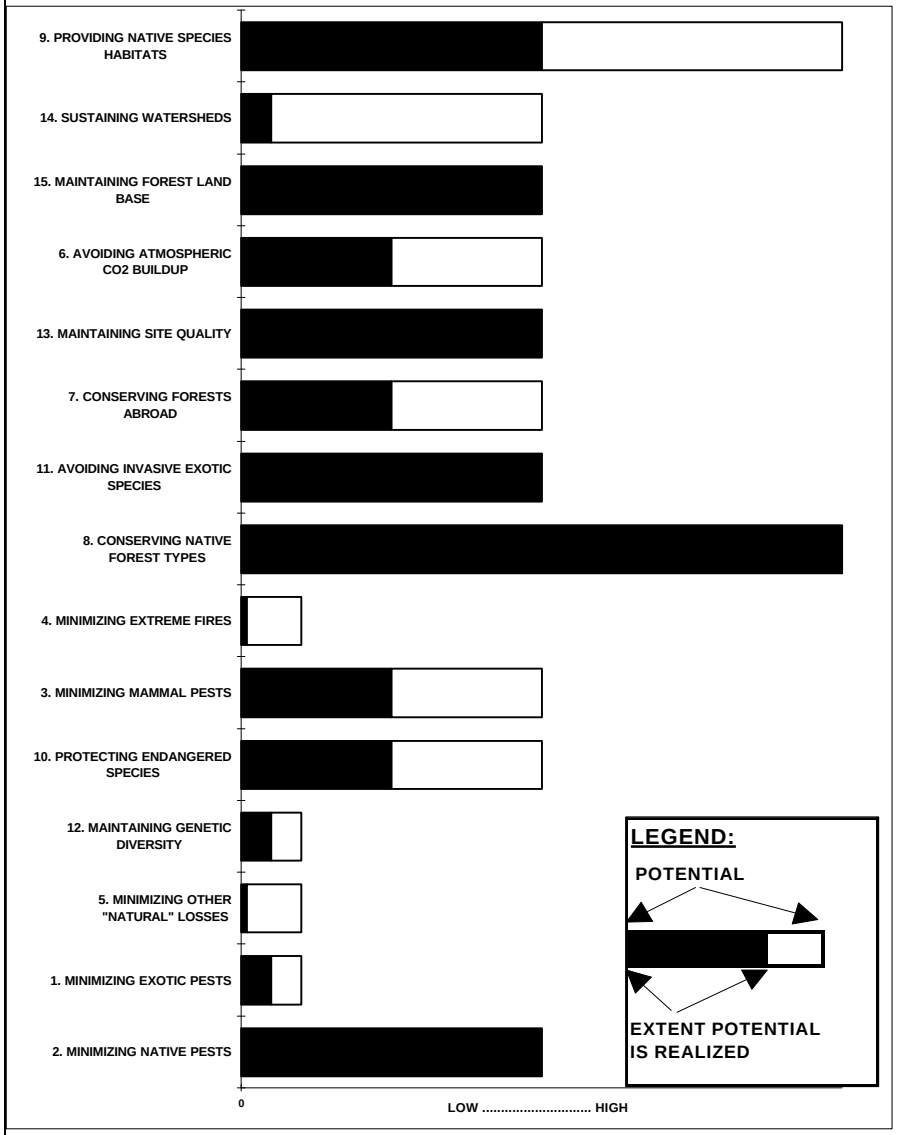
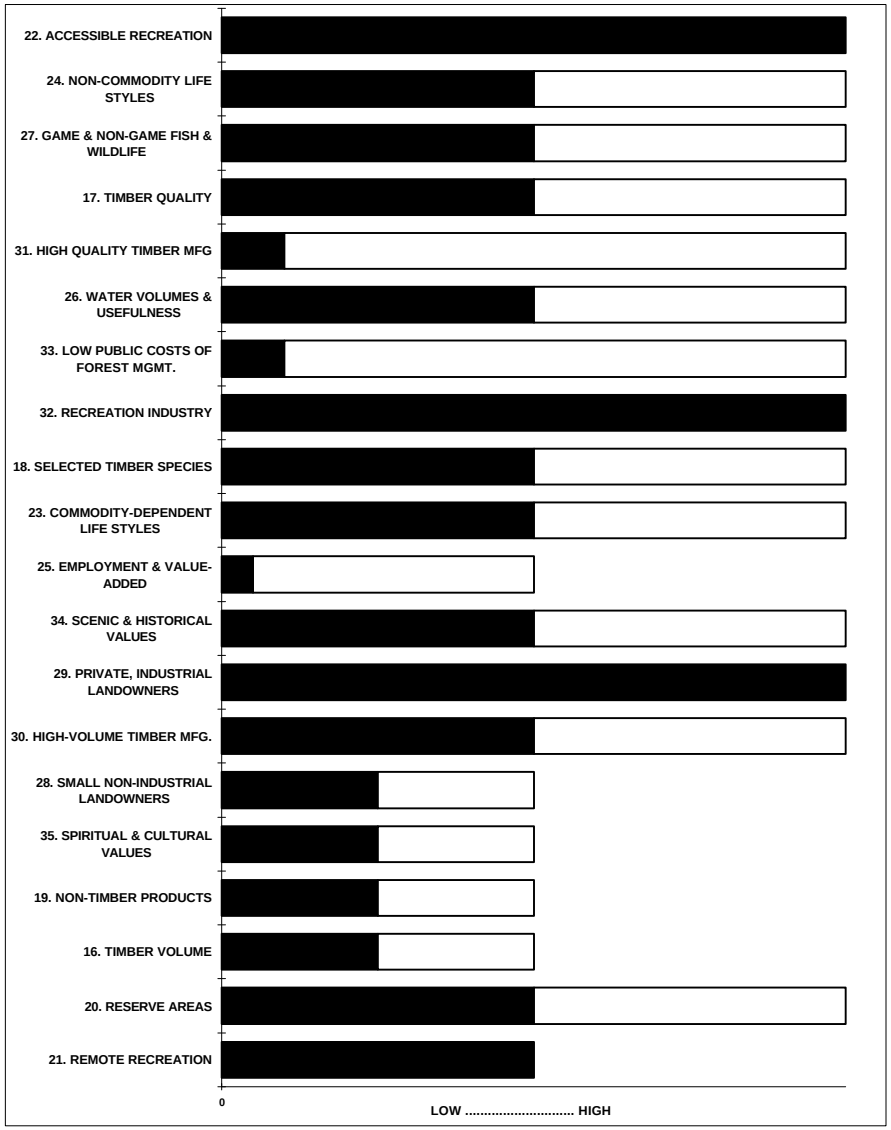


FIGURE 1.4.5B. POTENTIAL TO PROVIDE AND EXTENT PROVIDING CONTRIBUTIONS FROM FORESTS--PACIFIC COAST.
(from TABLE 1.1B)



UNREALIZED POTENTIAL IS SHOWN AS CLEAR PORTION OF BARS; RANKED BY NATIONAL POTENTIAL (FIGURE 1.2.1A&B).

FIGURE 1.4.6A. POTENTIAL TO ACHIEVE AND EXTENT ACHIEVING FOREST CONDITIONS--ALASKA.
(from TABLE 1.1A)

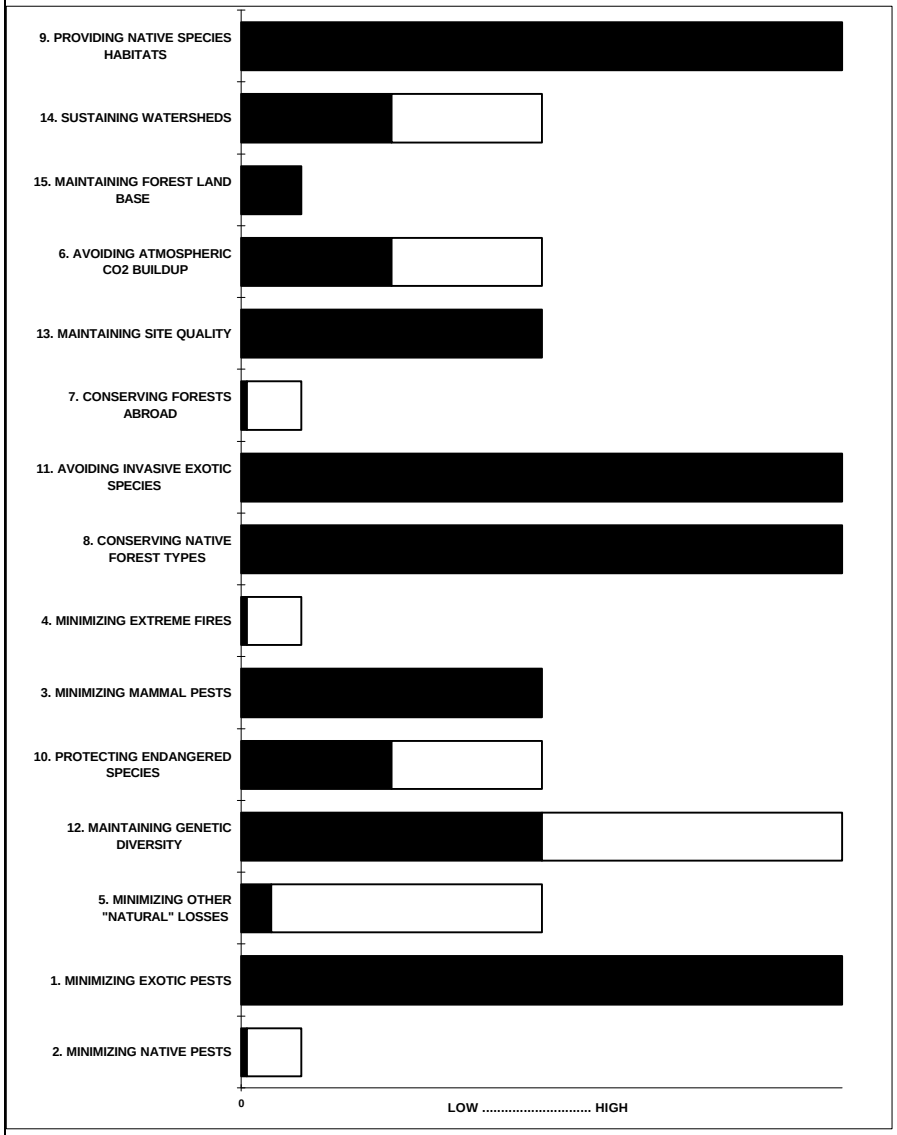
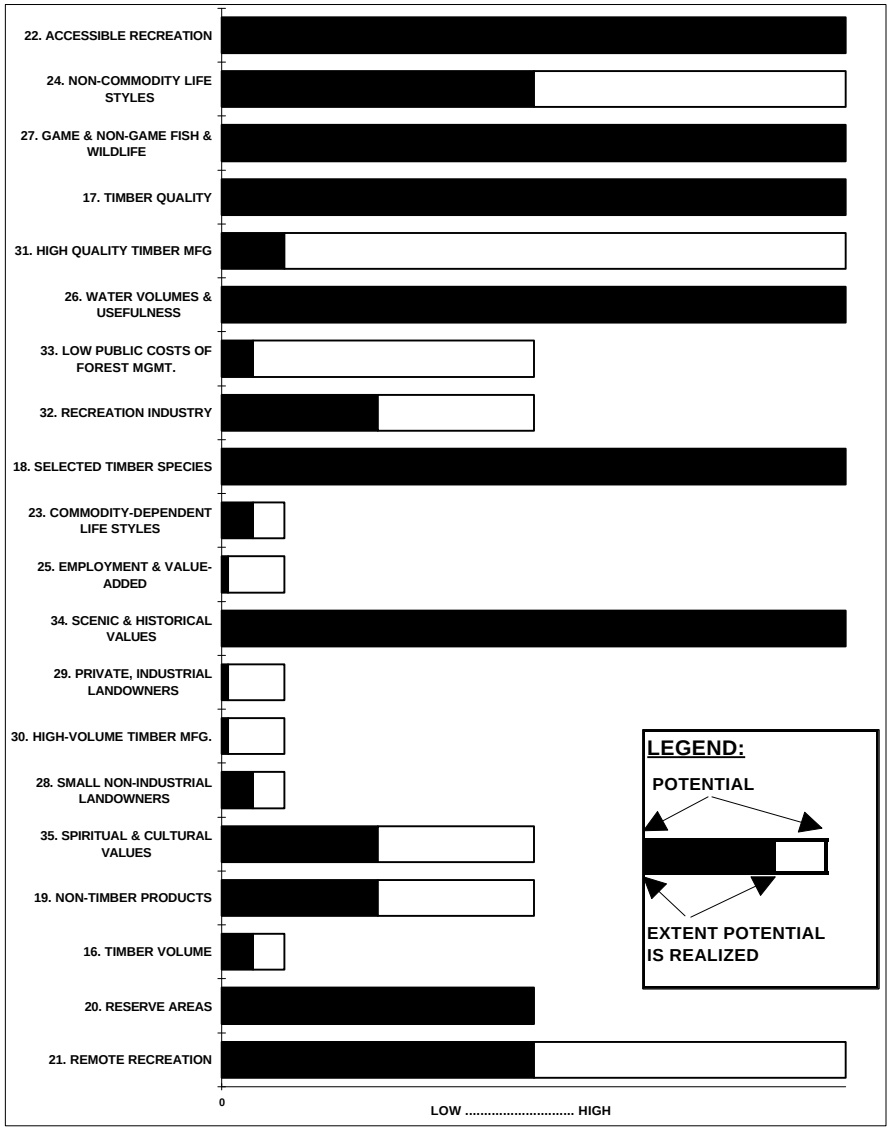


FIGURE 1.4.6B. POTENTIAL TO PROVIDE AND EXTENT PROVIDING CONTRIBUTIONS FROM FORESTS--ALASKA.
(from TABLE 1.1B)



UNREALIZED POTENTIAL IS SHOWN AS CLEAR PORTION OF BARS; RANKED BY NATIONAL POTENTIAL (FIGURE 1.2.1A&B).

FIGURE 1.5A. CONDITIONS ACHIEVED UNDER FINANCIAL EFFICIENCY MANAGEMENT (from TABLE 1.1A).

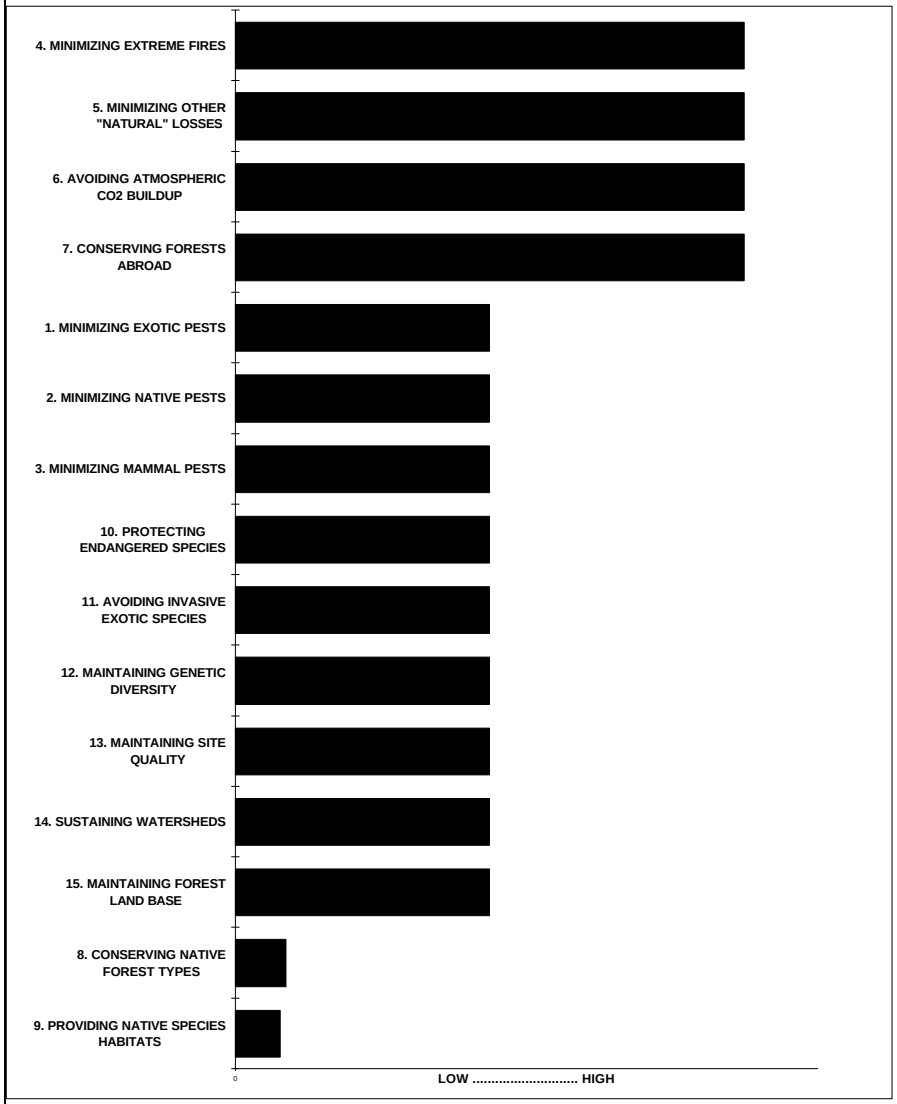
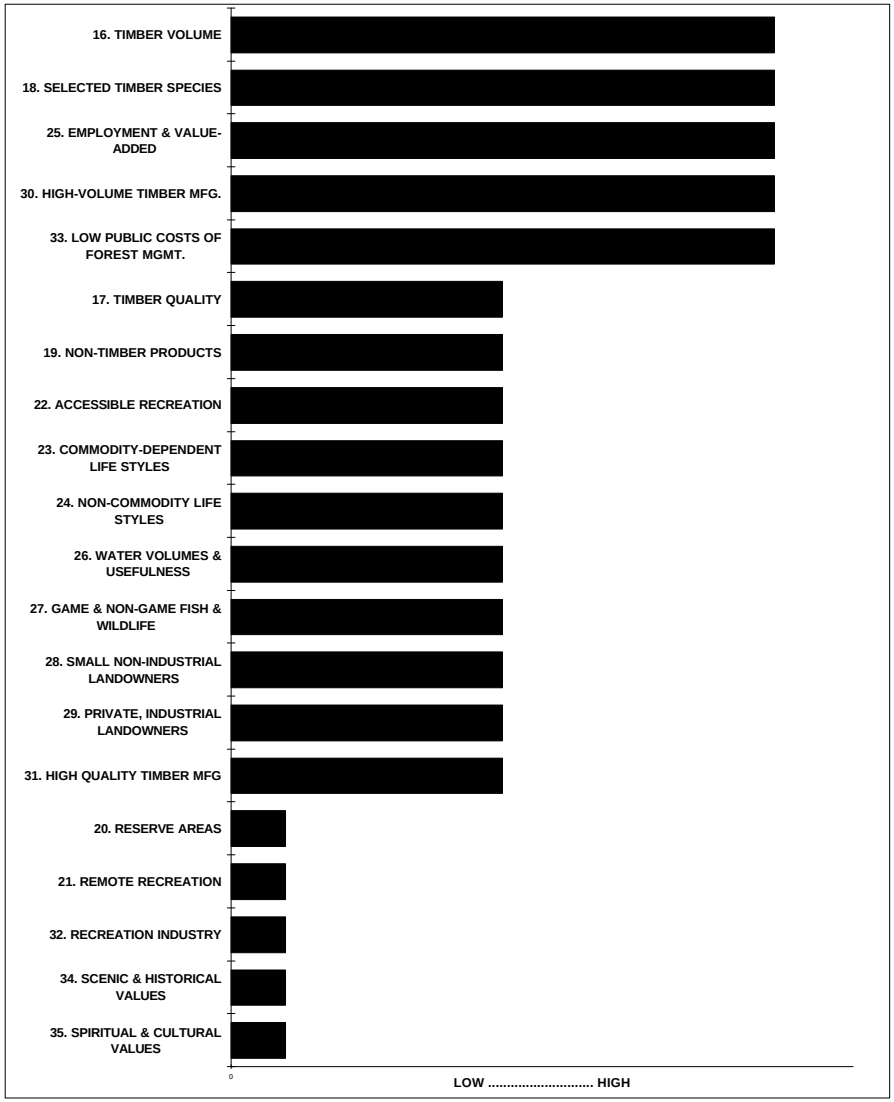


FIGURE 1.5B. CONTRIBUTIONS PROVIDED UNDER FINANCIAL EFFICIENCY MANAGEMENT (from TABLE 1.1B).



RANKED FROM HIGHEST TO LOWEST CONTRIBUTION.

FIGURE 1.6A. CONDITIONS ACHIEVED UNDER INTEGRATED MANAGEMENT (from TABLE 1.1A).

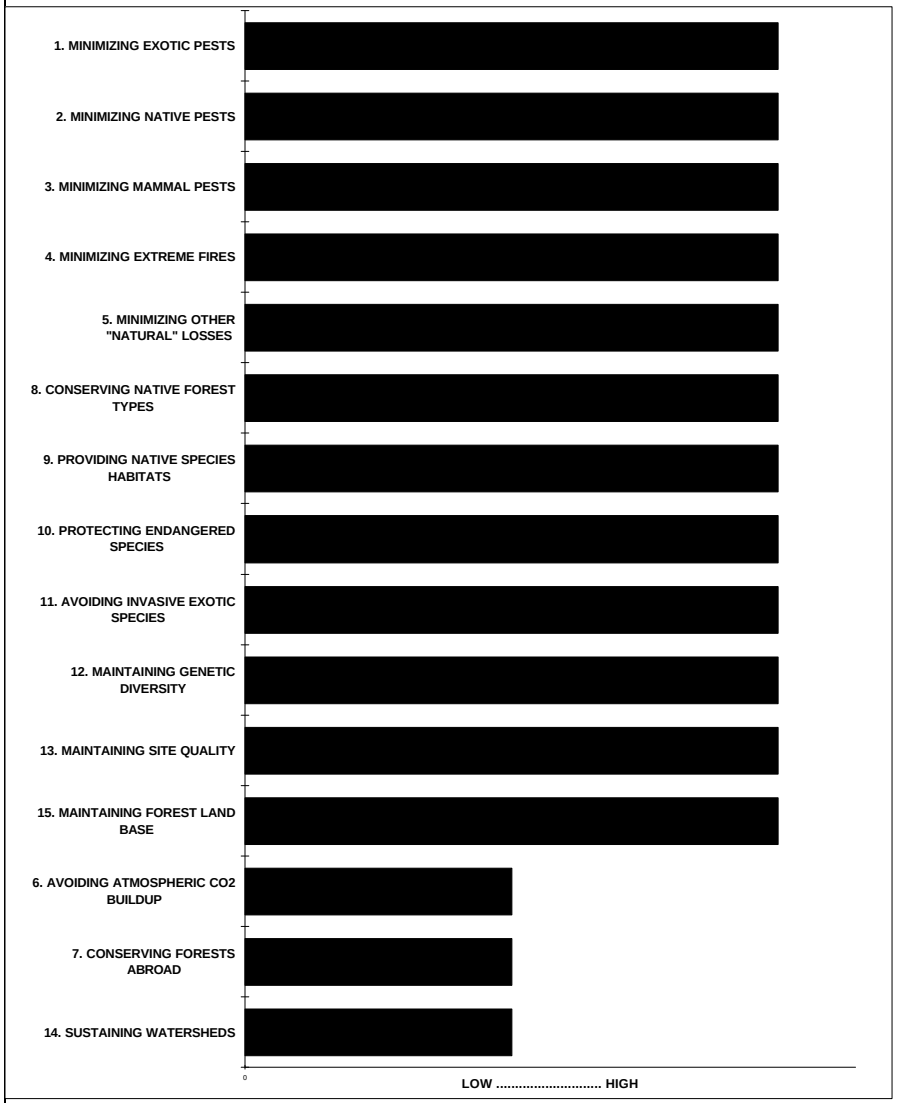
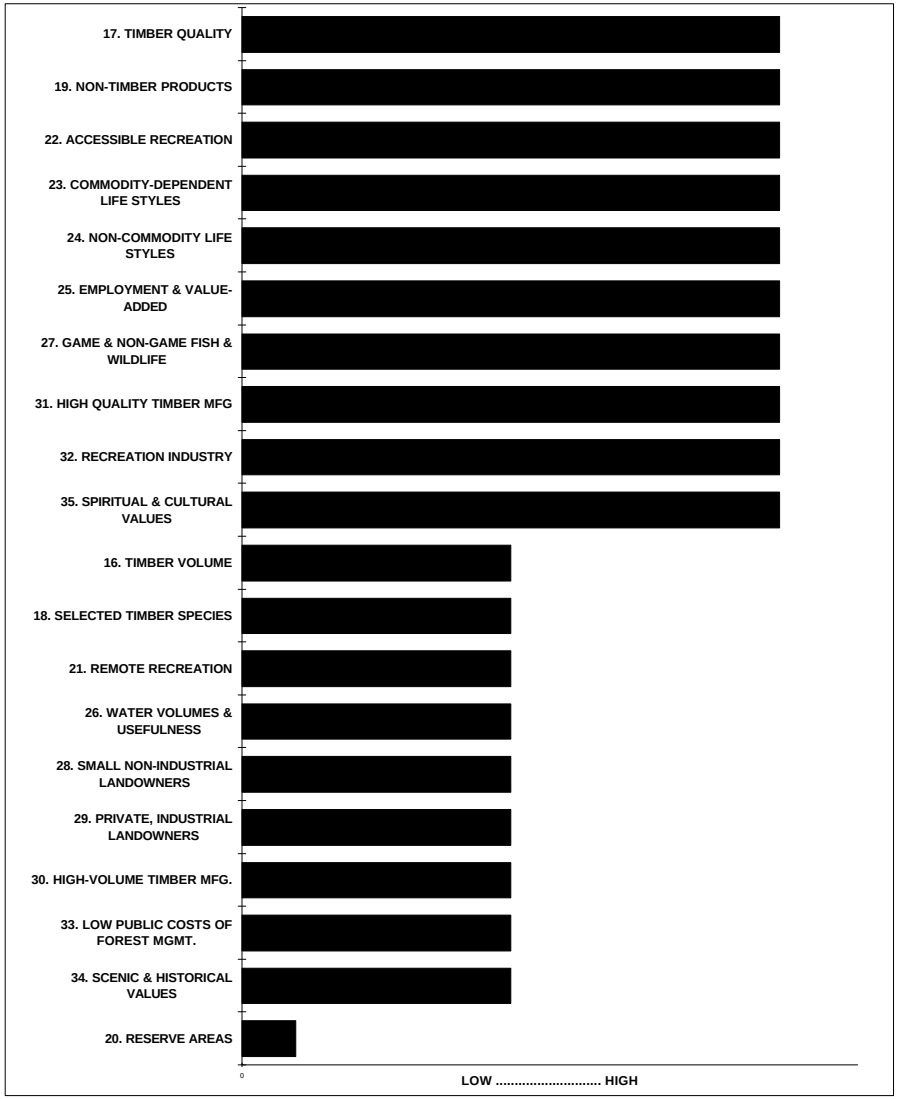


FIGURE 1.6B. CONTRIBUTIONS PROVIDED UNDER INTEGRATED MANAGEMENT (from TABLE 1.1B).



RANKED FROM HIGHEST TO LOWEST CONTRIBUTION.

FIGURE 1.7A. CONDITIONS ACHIEVED UNDER MANAGEMENT WITHOUT COMMODITY EXTRACTION (from TABLE 1.1A).

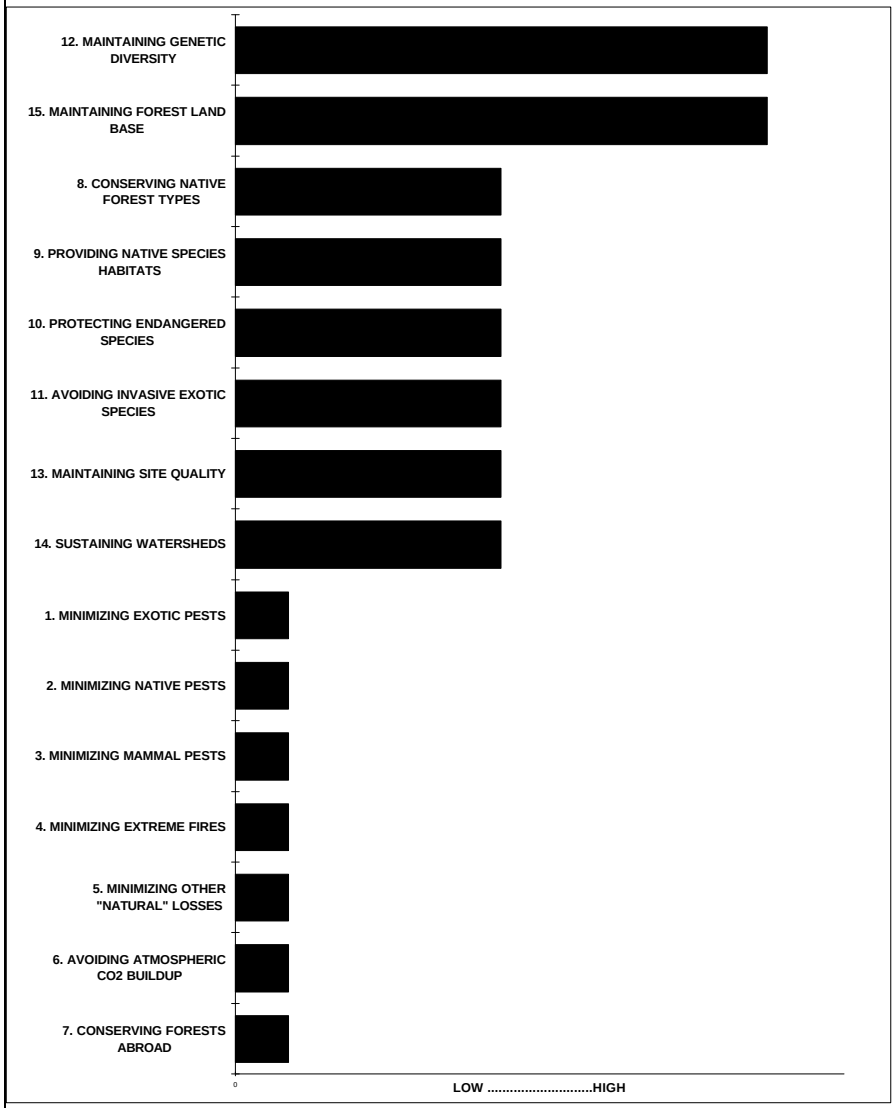
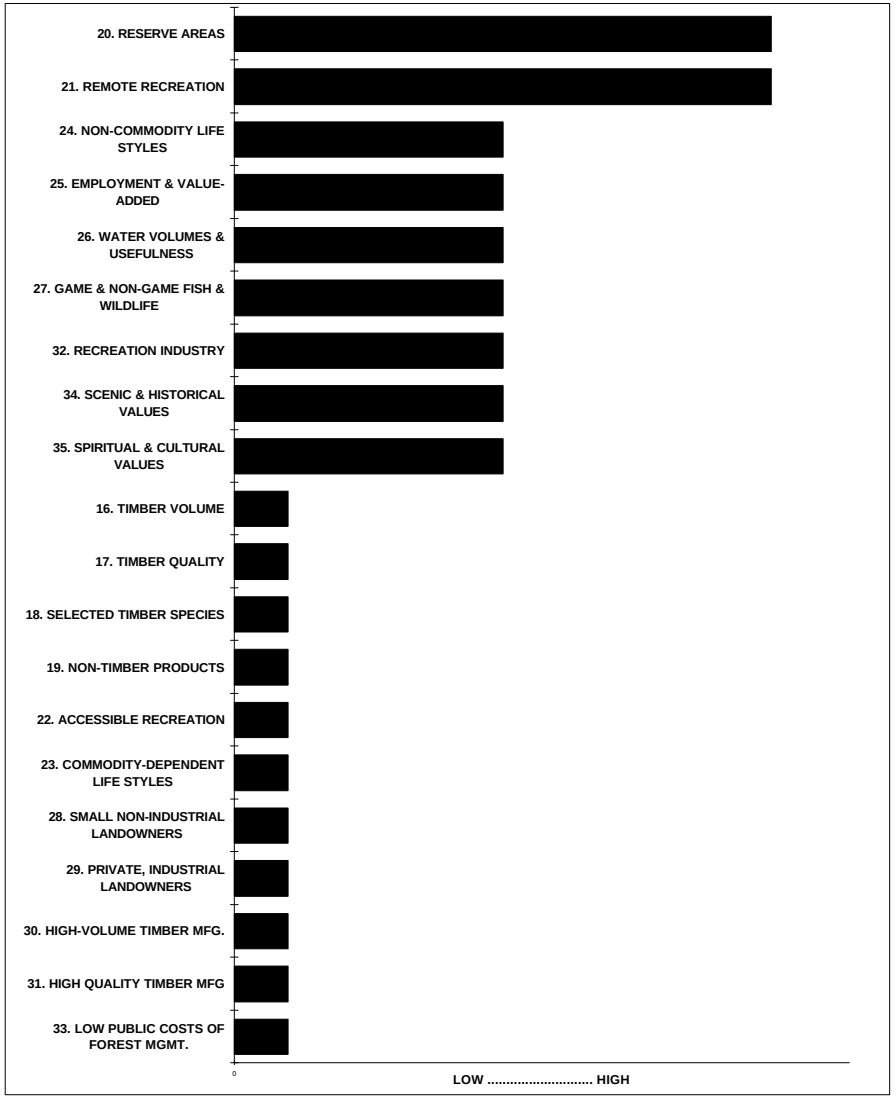
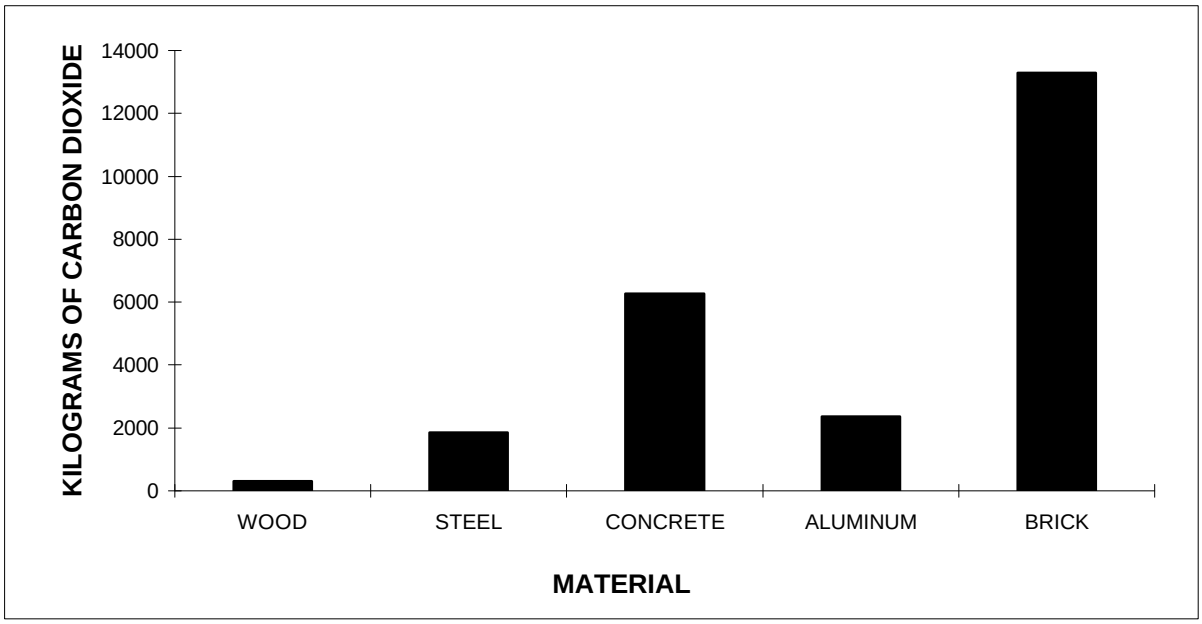


FIGURE 1.7B. CONTRIBUTIONS PROVIDED UNDER MANAGEMENT WITHOUT COMMODITY EXTRACTION (from TABLE 1.1B).



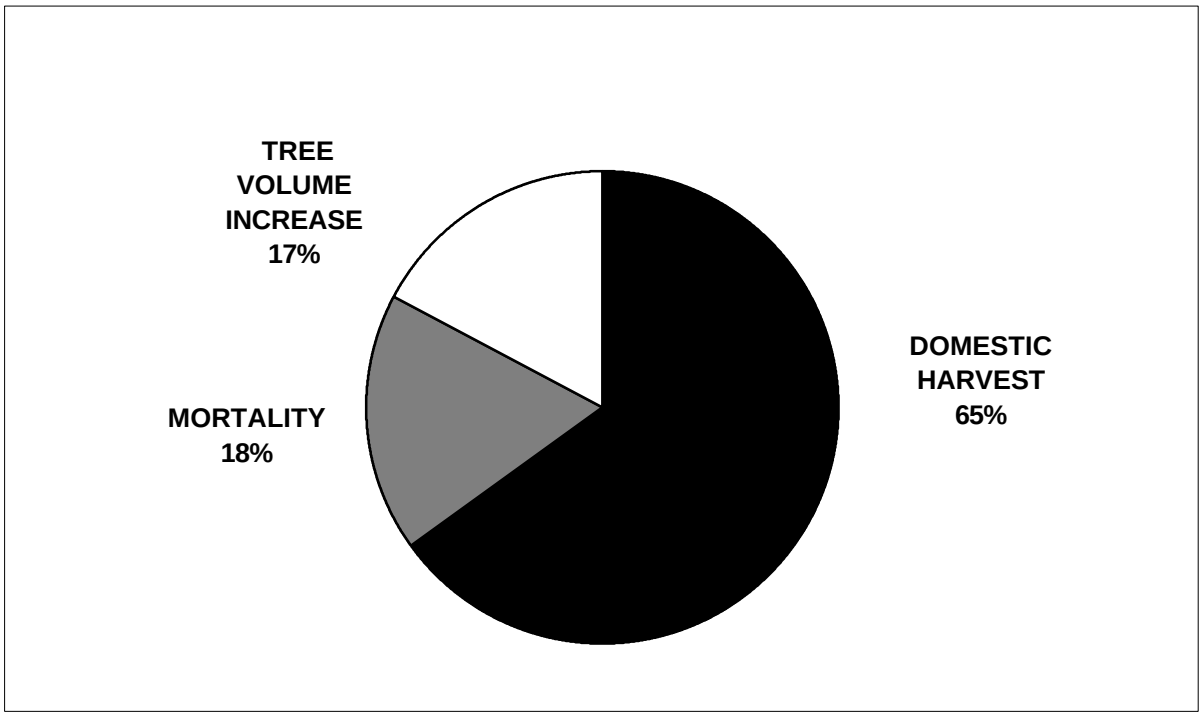
RANKED FROM HIGHEST TO LOWEST CONTRIBUTION.

FIGURE 1.8. CARBON DIOXIDE RELEASED TO PRODUCE WOOD PRODUCTS AND THEIR SUBSTITUTES.



(Values may change somewhat with product innovation and recalculation.)

FIGURE 1.9. WOOD GROWTH AND HARVEST.



THE UNITED STATES IS HARVESTING LESS THAN 65 PERCENT OF THE WOOD IT IS GROWING (Powell et al. 1993)

FIGURE 1.10. TREE VOLUME CHANGE BY REGIONS FROM 1952 TO 1992.

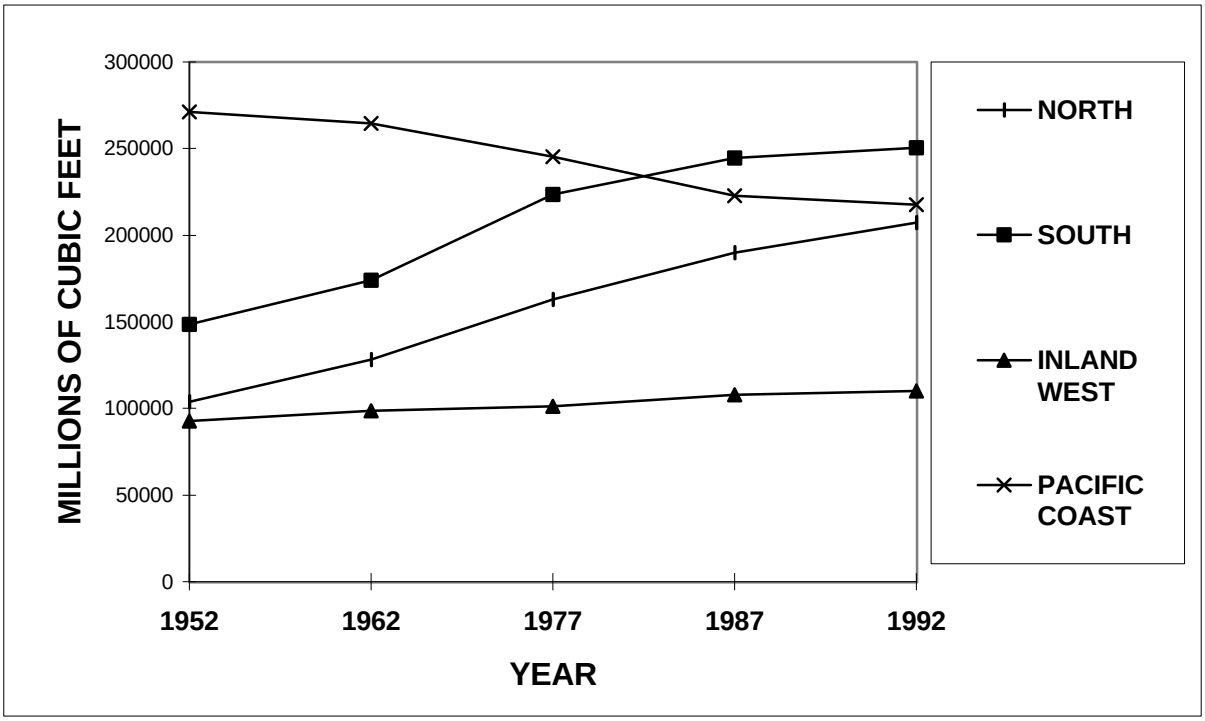


FIGURE 1.11. CHANGE IN URBAN AND RURAL POPULATION IN THE UNITED STATES FROM 1940 TO 1990.

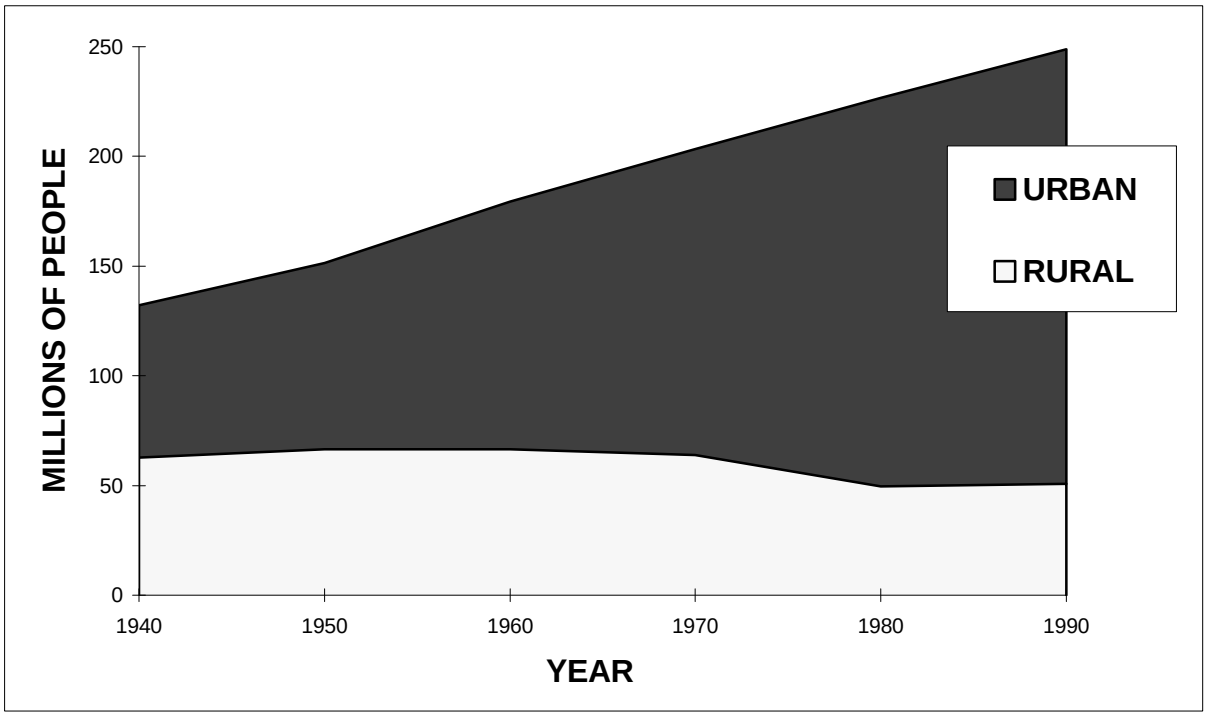


FIGURE 1.12. PROPORTION OF UNITED STATES' TOTAL POPULATION, PRODUCTIVE FOREST RESERVES, AND TOTAL SET-ASIDES IN EACH REGION.

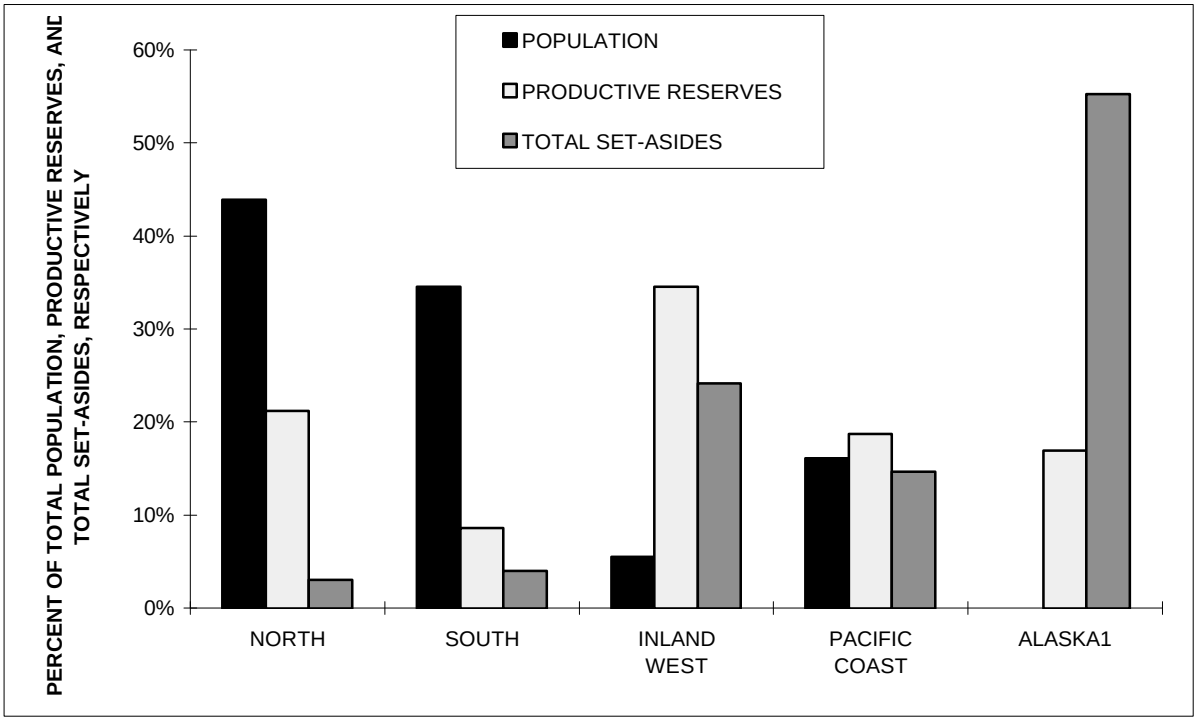


FIGURE 1.13. HARVEST, MORTALITY, AND VOLUME INCREASE IN EACH REGION.

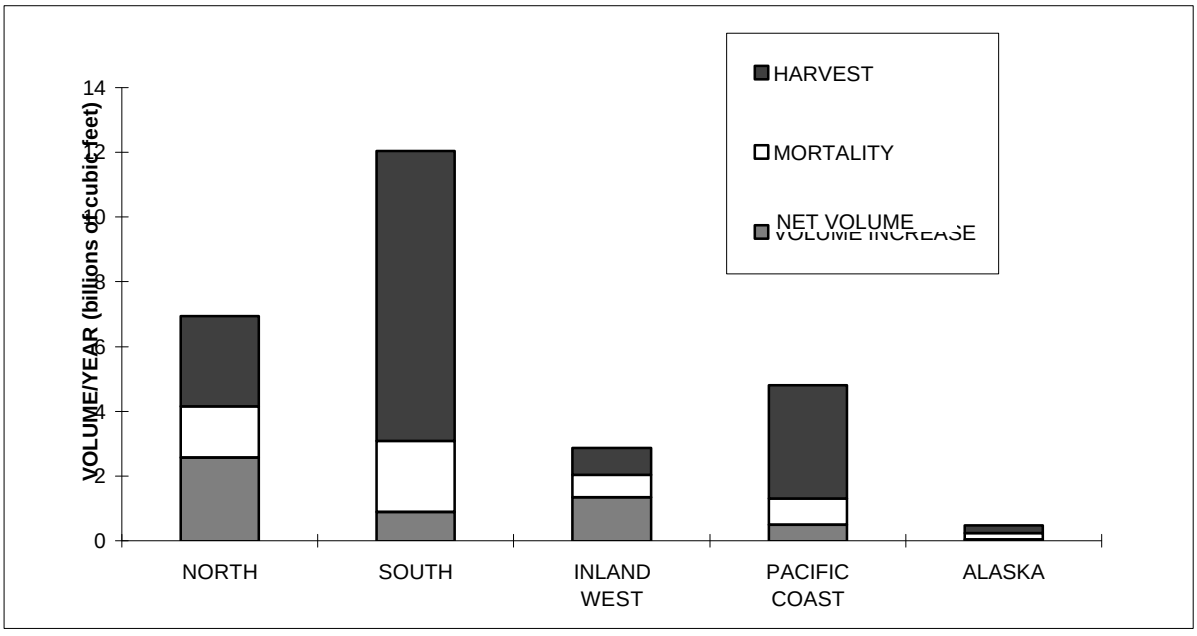


FIGURE 1.14. TREE SIZE DISTRIBUTION OF TREES IN EACH REGION.

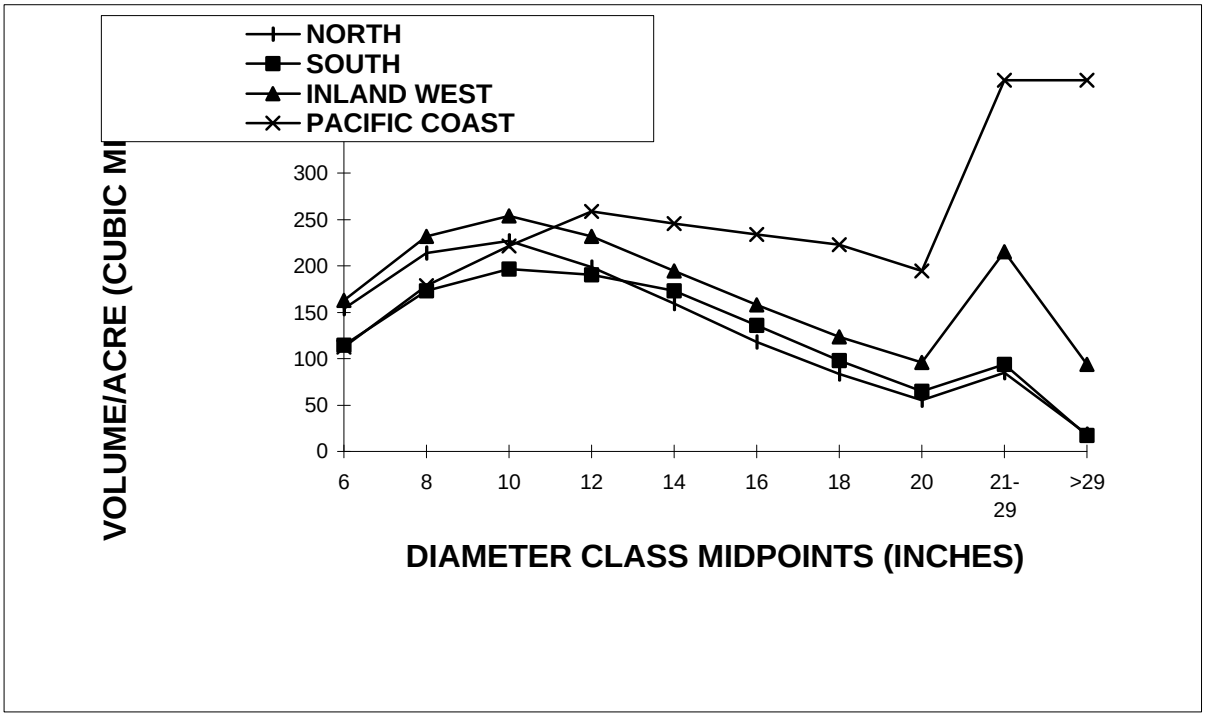


FIGURE 1.15. AREA BURNED ANNUALLY BY WILDFIRES IN THE WESTERN UNITED STATES, 1940-1944.

(Data courtesy of R.N.Sampson, American Forests)

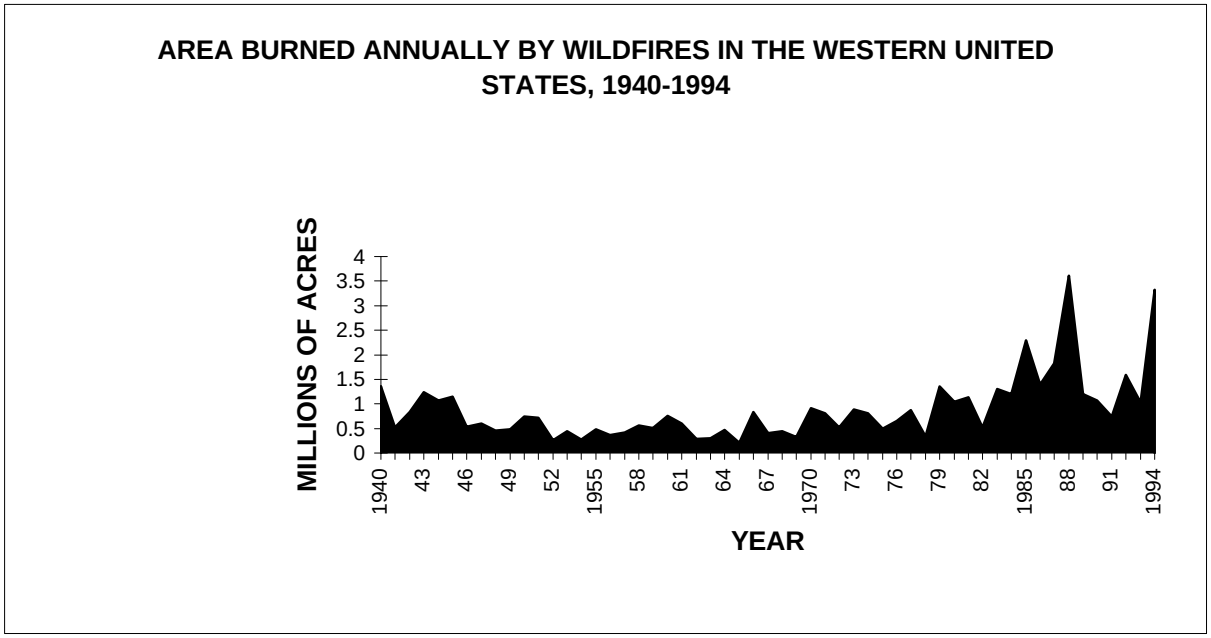


TABLE 1.1. FREQUENTLY EXPRESSED FOREST VALUES

(These values have been expressed in various formats. The relative importance of each value is determined by policymakers and landowners.)

TABLE 1.1A. VALUES EXPRESSED AS CONDITIONS AND FUNCTIONS OF THE FOREST.

SUSTAINING GROWTH OF FORESTS BY:

1. MINIMIZING LEVELS OF EXOTIC INSECT & DISEASE PESTS
2. MINIMIZING CATASTROPHIC LEVELS OF NATIVE MAMMALS
3. MINIMIZING CATASTROPHIC LEVELS OF NATIVE INSECT & DISEASE PESTS
4. MINIMIZING CATASTROPHIC FIRE EVENTS
5. MINIMIZING LOSSES FROM CATASTROPHIC WINDS & OTHER "NATURAL" EVENTS

SUSTAINING THE GLOBAL ENVIRONMENT BY:

6. AVOIDING ATMOSPHERIC CO2 & OTHER POLLUTANT BUILDUP
7. CONSERVING NATIVE FORESTS IN OTHER COUNTRIES

ENSURING PLANT AND ANIMAL DIVERSITY BY:

8. CONSERVING & RESTORING NATIVE FOREST TYPES & SPECIES
9. PROVIDING HABITATS FOR NATIVE SPECIES WITHIN FOREST TYPES
10. ENSURING SURVIVAL & RECOVERY OF THREATENED & ENDANGERED SPECIES
11. PROTECTING NATIVE SPECIES FROM INVASIVE EXOTIC SPECIES
12. MAINTAINING GENETIC DIVERSITY & ARCHITECTURE

ENSURING THE PRODUCTIVITY OF FUTURE FORESTS BY:

13. MAINTAINING SITE QUALITY
14. SUSTAINING WATERSHEDS
15. MAINTAINING FOREST LAND BASE

TABLE 1.1B. VALUES EXPRESSED AS CONTRIBUTIONS TO QUALITY OF LIFE

(but not listed in Table 1.1A).

TIMBER PRODUCTS

16. TIMBER VOLUME
17. TIMBER QUALITY
18. SELECTED SPECIES

19. NON-TIMBER, NON-WILDLIFE PRODUCTS
20. RESERVE AREAS

RECREATIONAL OPPORTUNITIES

21. REMOTE
22. ACCESSIBLE

RURAL LIFESTYLES

23. COMMODITY-DEPENDENT
24. NON-COMMODITY-DEPENDENT

25. EARNINGS, EMPLOYMENT, & VALUE-ADDED
26. WATER VOLUMES & USEFULNESS
27. GAME & NON-GAME FISH & WILDLIFE

VIABILITY OF VARIOUS FOREST ECONOMIC SEGMENTS

28. SMALL, PRIVATE, NON-INDUSTRIAL LANDOWNERS
29. PRIVATE, INDUSTRIAL LANDOWNERS
30. HIGH-VOLUME TIMBER PRODUCTS MANUFACTURERS
31. PRODUCTS MANUFACTURERS UTILIZING HIGH QUALITY TIMBER
32. RECREATION INDUSTRY

33. LOW PUBLIC COSTS OF MANAGING FOREST LANDS
34. SCENIC, EXISTENCE, & HISTORICAL VALUES
35. SPIRITUAL & CULTURAL VALUES

TABLE 1.2. EXAMPLES OF THREATENED & ENDANGERED FOREST SPECIES BY REGION.

North:

- **Karner blue butterfly (*Lycaeides melissa samuelis*)**
- **Eastern cougar (*Felis concolor cougar*)**
- **Virginia northern flying squirrel (*Glaucomys asbrinus fuscus*)**
- **Extinct**
  - **Wood bison (*Bison bison athabascae*) populations found in Canada**
  - **Heath hen *(Tympanuchus cupido cupido)***

South

- **Eastern cougar (*Felis concolor cougar*)**
- **Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*)**
- **Red-cockaded woodpecker (*Picoides borealis*)**
- **Carolina northern flying squirrel (*Glaucomys sabrinus coloratus*)**
- **Red wolf (*Canis rufus*)**
- **Florida panther (*Felis concolor coryi*)**
- **American black bear (*Ursus americanus*)**
- **Louisiana black bear (*Ursus americanus luteolus*)**
- **Extinct:**
  - **Ivory billed woodpecker (*Campephilus principalis*)**

Inland West

- **Woodland caribou (*Rangifer tarandus caribou*)**
- **Brown bear or grizzly bear (*Ursus arctos horribilis*)**
- **Mexican spotted owl (*Strix occidentalis lucida*)**

Pacific Coast

- **Oregon silverspot butterfly (*Speyeria zerene hippolyta*)**
- **Columbian white-tailed deer (*Odocoileus virginianus leucurus*)**
- **Northern spotted owl (*Strix occidentalis caurina*)**
- **Woodland caribou (*Rangifer tarandus caribou*)**
- **Brown bear or grizzly bear (*Ursus arctos horribilis*)**
- **Lotis blue butterfly (*Lycaeides argyrognomon lotis*)**
- **Marbled murrelet (*Brachyramphus marmoratus marmoratus*)**

REF: Lowe, D.W., J.R.Matthews, and C.J.Moseley (editors). 1990. The official World Wildlife Fund guide to endangered species of North America. Beacham Publishing, Inc. Washington, D.C. Four volumes.

THESE SPECIES ARE PRIMARILY ASSOCIATED WITH SAVANNA, OPEN, AND COMPLEX FOREST STRUCTURES. (See Figure 1.3.)

TABLE1.3. EFFECTS OF DIFFERENT MANAGEMENT APPROACHES ON VALUES FOR ALL UNITED STATES(Numbered values (from Table 1) show relative value from 1 (lowest) to 10 (highest).

	PRESENT	TIMBER MANAGEMENT	INTEGRATED	NO COMMODITY
		AREA IN EACH APPROACH		
TIMBER MANAGEMENT AREA (millions of acres)	404	525	0	0
INTEGRATED AREA (millions of acres)	85	0	525	0
NON-COMMODITY AREA (millions of acres)	36	0	0	525
		SELECTED ECONOMIC MEASURES		
TIMBER HARVEST VOLUME (billion FT3/year)	16.3	21.6	19.2	0.0
EMPLOYMENT (thousands of people)				
FORESTRY & LOGGING	129	154	269	3
LUMBER & WOOD PRODUCTS	752	949	1,258	0
PAPER & ALLIED PRODUCTS	691	906	806	0
CARPENTERS	1,255	1,661	1,477	0
INDIRECT	2,827	3,671	3,809	3
TOTAL	5,654	7,342	7,619	6
NET TIMBER IMPORT(-) OR EXPORT (+) (billion FT3/year)	0.0	5.3	2.9	-16.3
PUBLIC COST OF MANAGEMENT (billions of dollars)	4	3	6	87
PUBLIC RETURN FROM MANAGEMENT (billions of dollars)3	20	55	56	0
	ESTIMATED RELATIVE CONTRIBUTION OF THE APPROACH TO INCREASING THE POTENTIAL AND/OR REALIZATION OF VALUES IN TABLE 1.1. (1= lowest; 10= highest)			
1. MINIMIZING EXOTIC PESTS	5	5	10	1
2. MINIMIZING NATIVE PESTS	4	5	10	1
3. MINIMIZING MAMMAL PESTS	5	5	10	1
4. MINIMIZING EXTREME FIRES	5	10	10	1
5. MINIMIZING OTHER "NATURAL" LOSSES	5	10	10	1
6. AVOIDING ATMOSPHERIC CO2 BUILDUP	5	10	5	1
7. CONSERVING FORESTS ABROAD	4	10	5	1
8. CONSERVING NATIVE FOREST TYPES	5	1	10	5
9. PROVIDING NATIVE SPECIES HABITATS	4	1	10	5
10. PROTECTING ENDANGERED SPECIES	5	5	10	5
11. AVOIDING INVASIVE EXOTIC SPECIES	6	5	10	5
12. MAINTAINING GENETIC DIVERSITY	6	5	10	10
13. MAINTAINING SITE QUALITY	6	5	10	5
14. SUSTAINING WATERSHEDS	4	5	5	5
15. MAINTAINING FOREST LAND BASE	7	5	10	10
16. TIMBER VOLUME	4	10	5	1
17. TIMBER QUALITY	4	5	10	1
18. SELECTED TIMBER SPECIES	3	10	5	1
19. NON-TIMBER PRODUCTS	5	5	10	1
20. RESERVE AREAS	3	1	1	10
21. REMOTE RECREATION	3	1	5	10
22. ACCESSIBLE RECREATION	7	5	10	1
23. COMMODITY-DEPENDENT LIFE STYLES	5	5	10	1
24. NON-COMMODITY LIFE STYLES	6	5	10	5
25. EMPLOYMENT & VALUE-ADDED	3	10	10	5
26. WATER VOLUMES & USEFULNESS	5	5	5	5
27. GAME & NON-GAME FISH & WILDLIFE	5	5	10	5
28. SMALL NON-INDUSTRIAL LANDOWNERS	5	5	5	1
29. PRIVATE, INDUSTRIAL LANDOWNERS	6	5	5	1
30. HIGH-VOLUME TIMBER MFG.	4	10	5	1
31. HIGH QUALITY TIMBER MFG	3	5	10	1
32. RECREATION INDUSTRY	5	1	10	5
33. LOW PUBLIC COSTS OF FOREST MGMT.	6	10	5	1
34. SCENIC & HISTORICAL VALUES	5	1	5	5
35. SPIRITUAL & CULTURAL VALUES	5	1	10	5

TABLE 1.4. SUMMARY OF POLICY OPTIONS BY MANAGEMENT APPROACH AND OWNERSHIP CLASS.

	POLICY OPTIONS							
	OPTION # 1	OPTION # 2	OPTION # 3	OPTION # 4	OPTION # 5	OPTION # 6	OPTION # 7	OPTION # 8
TIMBER MANAGEMENT FOR FINANCIAL EFFICIENCY	NF OP FI NIPF	50% NF OP FI NIPF	OP FI	OP FI	OP FI	NIPF	NIPF	
INTEGRATED MANAGEMENT			NF NIPF	50% NF NIPF	NIPF	NF OP FI	OP FI	OP FI NIPF
MANAGEMENT WITHOUT COMMODITY EXTRACTION	PR	PR 50% NF	PR	PR 50% NF	PR NF	PR	PR NF	PR NF

PR = PRESENT, PRODUCTIVE RESERVES

NF = NATIONAL FORESTS

OP = OTHER PUBLIC FORESTS

FI = PRIVATE, INDUSTRIAL FORESTS

NIPF = NON-INDUSTRIAL, PRIVATE FORESTS

TABLE 1.5. SUMMARY OF EFFECTS OF POLICY OPTIONS FOR ALL UNITED STATES.
(Values are relative and not directly comparable to present condition.)

	POLICY OPTIONS								
	PRESENT	OPTION # 1	OPTION # 2	OPTION # 3	OPTION # 4	OPTION # 5	OPTION # 6	OPTION # 7	OPTION # 8
AREA IN EACH APPROACH									
TIMBER MANAGEMENT AREA (millions of acres)	404	490	447	117	117	117	288	288	0
INTEGRATED AREA (millions of acres)	85	0	0	372	330	288	202	117	405
NON-COMMODITY AREA (millions of acres)	36	36	78	36	78	120	36	120	120
SELECTED ECONOMIC MEASURES									
TIMBER HARVEST VOLUME (billion FT3/year)	16.3	20.3	18.5	18.3	16.7	15.1	19.2	15.9	14.4
EMPLOYMENT (thousands of people)									
FORESTRY & LOGGING	129	143	131	222	200	179	188	145	205
LUMBER & WOOD PRODUCTS	752	895	813	1,097	990	884	1,010	798	951
PAPER & ALLIED PRODUCTS	691	854	776	768	701	633	805	670	605
CARPENTERS	1,255	1,565	1,423	1,408	1,284	1,161	1,476	1,228	1,109
INDIRECT	2,827	3,457	3,143	3,495	3,176	2,857	3,479	2,841	2,869
TOTAL	5,654	6,914	6,285	6,990	6,352	5,714	6,957	5,681	5,738
NET TIMBER IMPORT(-) OR EXPORT (+) (billion FT3/year)	0.0	4.0	2.2	2.0	0.4	-1.2	2.9	-0.4	-1.9
PUBLIC COST OF MANAGEMENT (billions of dollars)	3.6	3.2	3.0	5.0	4.6	4.2	4.2	3.3	4.8
PUBLIC RETURN FROM MANAGEMENT (billions of dollars)3	19.8	46.1	32.5	44.2	31.2	18.2	44.1	18.1	17.4
ESTIMATED RELATIVE CONTRIBUTION OF THE APPROACH TO INCREASING THE POTENTIAL AND/OR REALIZATION OF VALUES IN TABLE 1.1. (1=lowest; 10=highest)									
1. MINIMIZING EXOTIC PESTS	5	5	4	8	7	6	7	5	4
2. MINIMIZING NATIVE PESTS	4	5	4	8	7	6	7	5	4
3. MINIMIZING MAMMAL PESTS	5	5	4	8	7	6	7	5	4
4. MINIMIZING EXTREME FIRES	5	9	8	9	8	7	9	7	7
5. MINIMIZING OTHER "NATURAL" LOSSES	5	9	8	9	8	7	9	7	7
6. AVOIDING ATMOSPHERIC CO2 BUILDUP	5	9	8	6	5	5	7	6	7
7. CONSERVING FORESTS ABROAD	4	9	8	6	5	5	7	6	7
8. CONSERVING NATIVE FOREST TYPES	5	1	2	7	7	6	6	4	2
9. PROVIDING NATIVE SPECIES HABITATS	4	1	2	7	7	6	6	4	2
10. PROTECTING ENDANGERED SPECIES	5	5	5	8	8	7	7	6	5
11. AVOIDING INVASIVE EXOTIC SPECIES	6	5	5	8	8	7	7	6	5
12. MAINTAINING GENETIC DIVERSITY	6	6	6	9	9	9	8	8	7
13. MAINTAINING SITE QUALITY	6	5	5	8	8	7	7	6	5
14. SUSTAINING WATERSHEDS	4	5	5	5	5	5	5	5	5
15. MAINTAINING FOREST LAND BASE	7	6	6	9	9	9	8	8	7
16. TIMBER VOLUME	4	9	8	6	5	5	7	6	7
17. TIMBER QUALITY	4	5	4	8	7	6	7	5	4
18. SELECTED TIMBER SPECIES	3	9	8	6	5	5	7	6	7
19. NON-TIMBER PRODUCTS	5	5	4	8	7	6	7	5	4
20. RESERVE AREAS	3	2	3	2	3	4	2	4	4
21. REMOTE RECREATION	3	2	3	5	5	6	4	5	4
22. ACCESSIBLE RECREATION	7	5	4	8	7	6	7	5	4
23. COMMODITY-DEPENDENT LIFE STYLES	5	5	4	8	7	6	7	5	4
24. NON-COMMODITY LIFE STYLES	6	5	5	8	8	7	7	6	5
25. EMPLOYMENT & VALUE-ADDED	3	9	9	9	9	8	9	8	8
26. WATER VOLUMES & USEFULNESS	5	5	5	5	5	5	5	5	5
27. GAME & NON-GAME FISH & WILDLIFE	5	5	5	8	8	7	7	6	5
28. SMALL NON-INDUSTRIAL LANDOWNERS	5	5	4	5	4	4	5	4	4
29. PRIVATE, INDUSTRIAL LANDOWNERS	6	5	4	5	4	4	5	4	4
30. HIGH-VOLUME TIMBER MFG.	4	9	8	6	5	5	7	6	7
31. HIGH QUALITY TIMBER MFG	3	5	4	8	7	6	7	5	4
32. RECREATION INDUSTRY	5	1	2	7	7	6	6	4	2
33. LOW PUBLIC COSTS OF FOREST MGMT.	6	9	8	6	5	5	7	6	7
34. SCENIC & HISTORICAL VALUES	5	1	2	4	4	4	3	3	2
35. SPIRITUAL & CULTURAL VALUES	5	1	2	7	7	6	6	4	2

TABLE 1.5B. THE SOUTH--SUMMARY OF EFFECTS OF POLICY OPTIONS.

	POLICY OPTIONS								
	PRESENT	OPTION # 1	OPTION # 2	OPTION # 3	OPTION # 4	OPTION # 5	OPTION # 6	OPTION # 7	OPTION # 8
AREA IN EACH APPROACH									
TIMBER MANAGEMENT AREA (millions of acres)	188	199	194	48	48	48	140	140	0
INTEGRATED AREA (millions of acres)	12	0	0	151	146	140	60	48	188
NON-COMMODITY AREA (millions of acres)	3	3	9	3	9	15	3	15	15
SELECTED ECONOMIC MEASURES									
TIMBER HARVEST VOLUME (billion FT3/year)	9.0	9.0	8.8	8.1	7.9	7.7	8.7	8.2	7.4
EMPLOYMENT (thousands of people)									
FORESTRY & LOGGING	60	63	61	98	95	92	77	71	103
LUMBER & WOOD PRODUCTS	402	397	386	488	473	458	433	403	487
PAPER & ALLIED PRODUCTS	376	379	368	341	331	322	364	345	310
CARPENTERS	689	695	675	625	607	590	668	633	568
INDIRECT	1,536	1,535	1,491	1,552	1,507	1,462	1,542	1,451	1,467
TOTAL	3,071	3,070	2,981	3,104	3,014	2,923	3,084	2,903	2,934
NET TIMBER IMPORT(-) OR EXPORT (+) (billion FT3/year)	0.0	0.1	-0.2	-0.8	-1.1	-1.3	-0.3	-0.7	-1.6
PUBLIC COST OF MANAGEMENT (billions of dollars)	0.5	0.5	1.8	1.2	2.0	3.3	0.8	3.2	3.4
PUBLIC RETURN FROM MANAGEMENT (billions of dollars)3	9.4	11.2	10.4	9.6	8.9	8.6	8.9	8.2	7.4
ESTIMATED RELATIVE CONTRIBUTION OF THE APPROACH TO INCREASING THE POTENTIAL AND/OR REALIZATION OF VALUES IN TABLE 1.1. (1=lowest; 10=highest)									
1. MINIMIZING EXOTIC PESTS		5	9	6	5	6	8	5	8
2. MINIMIZING NATIVE PESTS		5	9	6	5	6	8	5	8
3. MINIMIZING MAMMAL PESTS		5	9	6	5	6	8	5	8
4. MINIMIZING EXTREME FIRES		10	10	10	9	9	9	10	10
5. MINIMIZING OTHER "NATURAL" LOSSES		10	10	10	9	9	9	10	10
6. AVOIDING ATMOSPHERIC CO2 BUILDUP		10	6	8	9	8	6	10	6
7. CONSERVING FORESTS ABROAD		10	6	8	9	8	6	10	6
8. CONSERVING NATIVE FOREST TYPES		1	8	4	1	3	8	1	8
9. PROVIDING NATIVE SPECIES HABITATS		1	8	4	1	3	8	1	8
10. PROTECTING ENDANGERED SPECIES		5	9	6	5	6	8	5	9
11. AVOIDING INVASIVE EXOTIC SPECIES		5	9	6	5	6	8	5	9
12. MAINTAINING GENETIC DIVERSITY		5	9	7	5	7	9	5	9
13. MAINTAINING SITE QUALITY		5	9	6	5	6	8	5	9
14. SUSTAINING WATERSHEDS		5	5	5	5	5	5	5	5
15. MAINTAINING FOREST LAND BASE		5	9	7	5	7	9	5	9
16. TIMBER VOLUME		10	6	8	9	8	6	10	6
17. TIMBER QUALITY		5	9	6	5	6	8	5	8
18. SELECTED TIMBER SPECIES		10	6	8	9	8	6	10	6
19. NON-TIMBER PRODUCTS		5	9	6	5	6	8	5	8
20. RESERVE AREAS		1	1	1	2	2	2	1	1
21. REMOTE RECREATION		1	4	2	2	3	4	1	4
22. ACCESSIBLE RECREATION		5	9	6	5	6	8	5	8
23. COMMODITY-DEPENDENT LIFE STYLES		5	9	6	5	6	8	5	8
24. NON-COMMODITY LIFE STYLES		5	9	6	5	6	8	5	9
25. EMPLOYMENT & VALUE-ADDED		10	10	10	10	10	10	10	10
26. WATER VOLUMES & USEFULNESS		5	5	5	5	5	5	5	5
27. GAME & NON-GAME FISH & WILDLIFE		5	9	6	5	6	8	5	9
28. SMALL NON-INDUSTRIAL LANDOWNERS		5	5	5	5	5	5	5	5
29. PRIVATE, INDUSTRIAL LANDOWNERS		5	5	5	5	5	5	5	5
30. HIGH-VOLUME TIMBER MFG.		10	6	8	9	8	6	10	6
31. HIGH QUALITY TIMBER MFG		5	9	6	5	6	8	5	8
32. RECREATION INDUSTRY		1	8	4	1	3	8	1	8
33. LOW PUBLIC COSTS OF FOREST MGMT.		10	6	8	9	8	6	10	6
34. SCENIC & HISTORICAL VALUES		1	4	2	1	2	4	1	4
35. SPIRITUAL & CULTURAL VALUES		1	8	4	1	3	8	1	8

TABLE 1.5C. THE NORTH--SUMMARY OF EFFECTS OF POLICY OPTIONS .

	POLICY OPTIONS								
	PRESENT	OPTION # 1	OPTION # 2	OPTION # 3	OPTION # 4	OPTION # 5	OPTION # 6	OPTION # 7	OPTION # 8
AREA IN EACH APPROACH									
TIMBER MANAGEMENT AREA (millions of acres)	148	158	153	37	37	37	111	111	0
INTEGRATED AREA (millions of acres)	10	0	0	121	116	111	47	37	148
NON-COMMODITY AREA (millions of acres)	8	8	12	8	12	17	8	17	17
SELECTED ECONOMIC MEASURES									
TIMBER HARVEST VOLUME (billion FT3/year)	2.8	5.2	5.0	4.7	4.5	4.4	5.0	4.7	4.2
EMPLOYMENT (thousands of people)									
FORESTRY & LOGGING	22	36	35	57	55	53	44	40	59
LUMBER & WOOD PRODUCTS	126	229	222	281	272	263	249	231	279
PAPER & ALLIED PRODUCTS	117	218	212	196	190	185	210	198	178
CARPENTERS	215	400	388	359	349	338	385	364	326
INDIRECT	481	884	857	894	866	839	887	833	842
TOTAL	962	1,767	1,714	1,787	1,733	1,679	1,775	1,666	1,685
NET TIMBER IMPORT(-) OR EXPORT (+) (billion FT3/year)	0.0	2.4	2.3	1.9	1.7	1.6	2.2	1.9	1.4
PUBLIC COST OF MANAGEMENT (billions of dollars)	0.8	0.7	0.7	1.3	1.3	1.2	1.0	0.9	1.4
PUBLIC RETURN FROM MANAGEMENT (billions of dollars)3	3.3	18.5	17.4	18.2	17.1	16.0	18.2	16.0	15.7
ESTIMATED RELATIVE CONTRIBUTION OF THE APPROACH TO INCREASING THE POTENTIAL AND/OR REALIZATION OF VALUES IN TABLE 1.1. (1=lowest; 10=highest)									
1. MINIMIZING EXOTIC PESTS		5	8	6	5	6	8	5	8
2. MINIMIZING NATIVE PESTS		5	8	6	5	6	8	5	8
3. MINIMIZING MAMMAL PESTS		5	8	6	5	6	8	5	8
4. MINIMIZING EXTREME FIRES		10	10	10	9	9	9	9	9
5. MINIMIZING OTHER "NATURAL" LOSSES		10	10	10	9	9	9	9	9
6. AVOIDING ATMOSPHERIC CO2 BUILDUP		10	6	8	9	8	6	9	6
7. CONSERVING FORESTS ABROAD		10	6	8	9	8	6	9	6
8. CONSERVING NATIVE FOREST TYPES		1	8	4	1	3	7	1	8
9. PROVIDING NATIVE SPECIES HABITATS		1	8	4	1	3	7	1	8
10. PROTECTING ENDANGERED SPECIES		5	9	6	5	6	8	5	9
11. AVOIDING INVASIVE EXOTIC SPECIES		5	9	6	5	6	8	5	9
12. MAINTAINING GENETIC DIVERSITY		5	9	7	6	7	9	5	9
13. MAINTAINING SITE QUALITY		5	9	6	5	6	8	5	9
14. SUSTAINING WATERSHEDS		5	5	5	5	5	5	5	5
15. MAINTAINING FOREST LAND BASE		5	9	7	6	7	9	5	9
16. TIMBER VOLUME		10	6	8	9	8	6	9	6
17. TIMBER QUALITY		5	8	6	5	6	8	5	8
18. SELECTED TIMBER SPECIES		10	6	8	9	8	6	9	6
19. NON-TIMBER PRODUCTS		5	8	6	5	6	8	5	8
20. RESERVE AREAS		1	1	1	2	2	2	2	2
21. REMOTE RECREATION		1	4	3	2	3	5	2	4
22. ACCESSIBLE RECREATION		5	8	6	5	6	8	5	8
23. COMMODITY-DEPENDENT LIFE STYLES		5	8	6	5	6	8	5	8
24. NON-COMMODITY LIFE STYLES		5	9	6	5	6	8	5	9
25. EMPLOYMENT & VALUE-ADDED		10	10	10	9	9	9	10	10
26. WATER VOLUMES & USEFULNESS		5	5	5	5	5	5	5	5
27. GAME & NON-GAME FISH & WILDLIFE		5	9	6	5	6	8	5	9
28. SMALL NON-INDUSTRIAL LANDOWNERS		5	5	5	5	5	5	5	5
29. PRIVATE, INDUSTRIAL LANDOWNERS		5	5	5	5	5	5	5	5
30. HIGH-VOLUME TIMBER MFG.		10	6	8	9	8	6	9	6
31. HIGH QUALITY TIMBER MFG		5	8	6	5	6	8	5	8
32. RECREATION INDUSTRY		1	8	4	1	3	7	1	8
33. LOW PUBLIC COSTS OF FOREST MGMT.		10	6	8	9	8	6	9	6
34. SCENIC & HISTORICAL VALUES		1	4	2	1	2	4	1	4
35. SPIRITUAL & CULTURAL VALUES		1	8	4	1	3	7	1	8

TABLE 1.5D. THE INLAND WEST--SUMMARY OF EFFECTS OF POLICY OPTIONS.

	POLICY OPTIONS								
	PRESENT	OPTION # 1	OPTION # 2	OPTION # 3	OPTION # 4	OPTION # 5	OPTION # 6	OPTION # 7	OPTION # 8
AREA IN EACH APPROACH									
TIMBER MANAGEMENT AREA (millions of acres)	26	63	44	9	9	9	17	17	0
INTEGRATED AREA (millions of acres)	36	0	0	54	36	17	45	9	26
NON-COMMODITY AREA (millions of acres)	12	12	30	12	30	49	12	49	49
SELECTED ECONOMIC MEASURES									
TIMBER HARVEST VOLUME (billion FT3/year)	0.8	2.1	1.5	1.9	1.4	0.8	1.9	0.9	0.8
EMPLOYMENT (thousands of people)									
FORESTRY & LOGGING	11	15	11	24	17	9	23	8	11
LUMBER & WOOD PRODUCTS	45	94	67	119	83	47	115	44	51
PAPER & ALLIED PRODUCTS	35	90	64	80	57	34	81	36	33
CARPENTERS	64	165	117	146	105	63	149	66	60
INDIRECT	156	365	259	369	262	154	368	153	155
TOTAL	311	729	517	738	523	308	737	307	310
NET TIMBER IMPORT(-) OR EXPORT (+) (billion FT3/year)	0.0	1.3	0.7	1.1	0.5	0.0	1.1	0.0	0.0
PUBLIC COST OF MANAGEMENT (billions of dollars)	1.2	1.0	0.9	1.3	1.1	1.0	1.3	0.9	1.0
PUBLIC RETURN FROM MANAGEMENT (billions of dollars)3	1.4	7.1	4.1	6.6	3.8	1.1	6.5	1.1	1.0
ESTIMATED RELATIVE CONTRIBUTION OF THE APPROACH TO INCREASING THE POTENTIAL AND/OR REALIZATION OF VALUES IN TABLE 1.1. (1=lowest; 10=highest)									
1. MINIMIZING EXOTIC PESTS		4	8	7	2	3	4	3	6
2. MINIMIZING NATIVE PESTS		4	8	7	2	3	4	3	6
3. MINIMIZING MAMMAL PESTS		4	8	7	2	3	4	3	6
4. MINIMIZING EXTREME FIRES		9	9	9	4	4	4	6	6
5. MINIMIZING OTHER "NATURAL" LOSSES		9	9	9	4	4	4	6	6
6. AVOIDING ATMOSPHERIC CO2 BUILDUP		9	5	6	4	4	3	6	4
7. CONSERVING FORESTS ABROAD		9	5	6	4	4	3	6	4
8. CONSERVING NATIVE FOREST TYPES		2	8	7	4	5	6	3	7
9. PROVIDING NATIVE SPECIES HABITATS		2	8	7	4	5	6	3	7
10. PROTECTING ENDANGERED SPECIES		5	9	8	5	6	6	5	7
11. AVOIDING INVASIVE EXOTIC SPECIES		5	9	8	5	6	6	5	7
12. MAINTAINING GENETIC DIVERSITY		6	9	9	8	9	9	7	9
13. MAINTAINING SITE QUALITY		5	9	8	5	6	6	5	7
14. SUSTAINING WATERSHEDS		5	5	5	5	5	5	5	5
15. MAINTAINING FOREST LAND BASE		6	9	9	8	9	9	7	9
16. TIMBER VOLUME		9	5	6	4	4	3	6	4
17. TIMBER QUALITY		4	8	7	2	3	4	3	6
18. SELECTED TIMBER SPECIES		9	5	6	4	4	3	6	4
19. NON-TIMBER PRODUCTS		4	8	7	2	3	4	3	6
20. RESERVE AREAS		2	2	2	7	7	7	5	5
21. REMOTE RECREATION		2	5	5	7	7	8	5	7
22. ACCESSIBLE RECREATION		4	8	7	2	3	4	3	6
23. COMMODITY-DEPENDENT LIFE STYLES		4	8	7	2	3	4	3	6
24. NON-COMMODITY LIFE STYLES		5	9	8	5	6	6	5	7
25. EMPLOYMENT & VALUE-ADDED		9	9	9	7	7	7	8	8
26. WATER VOLUMES & USEFULNESS		5	5	5	5	5	5	5	5
27. GAME & NON-GAME FISH & WILDLIFE		5	9	8	5	6	6	5	7
28. SMALL NON-INDUSTRIAL LANDOWNERS		4	4	4	2	2	2	3	3
29. PRIVATE, INDUSTRIAL LANDOWNERS		4	4	4	2	2	2	3	3
30. HIGH-VOLUME TIMBER MFG.		9	5	6	4	4	3	6	4
31. HIGH QUALITY TIMBER MFG		4	8	7	2	3	4	3	6
32. RECREATION INDUSTRY		2	8	7	4	5	6	3	7
33. LOW PUBLIC COSTS OF FOREST MGMT.		9	5	6	4	4	3	6	4
34. SCENIC & HISTORICAL VALUES		2	5	4	4	4	5	3	5
35. SPIRITUAL & CULTURAL VALUES		2	8	7	4	5	6	3	7

TABLE 1.5E. THE PACIFIC COAST--SUMMARY OF EFFECTS OF POLICY OPTIONS.

	POLICY OPTIONS								
	PRESENT	OPTION # 1	OPTION # 2	OPTION # 3	OPTION # 4	OPTION # 5	OPTION # 6	OPTION # 7	OPTION # 8
AREA IN EACH APPROACH									
TIMBER MANAGEMENT AREA (millions of acres)	31	55	43	18	18	18	13	13	0
INTEGRATED AREA (millions of acres)	23	0	0	36	25	13	42	18	31
NON-COMMODITY AREA (millions of acres)	7	7	18	7	18	30	7	30	30
SELECTED ECONOMIC MEASURES									
TIMBER HARVEST VOLUME (billion FT3/year)	3.5	3.6	2.8	3.3	2.6	1.9	3.2	1.9	1.8
EMPLOYMENT (thousands of people)									
FORESTRY & LOGGING	31	25	20	37	28	19	39	21	25
LUMBER & WOOD PRODUCTS	176	158	125	190	146	102	195	107	118
PAPER & ALLIED PRODUCTS	147	151	119	138	110	82	136	80	75
CARPENTERS	270	277	218	253	201	150	249	146	138
INDIRECT	627	612	481	618	485	353	619	354	356
TOTAL	1,254	1,224	963	1,236	971	706	1,238	707	712
NET TIMBER IMPORT(-) OR EXPORT (+) (billion FT3/year)	0.0	0.1	-0.7	-0.2	-0.9	-1.6	-0.3	-1.6	-1.7
PUBLIC COST OF MANAGEMENT (billions of dollars)	0.8	1.1	5.0	1.1	5.0	8.9	1.1	8.9	8.9
PUBLIC RETURN FROM MANAGEMENT (billions of dollars)3	5.1	6.0	4.3	5.3	3.9	2.4	5.1	2.3	2.2
ESTIMATED RELATIVE CONTRIBUTION OF THE APPROACH TO INCREASING THE POTENTIAL AND/OR REALIZATION OF VALUES IN TABLE 1.1. (1=lowest; 10=highest)									
1. MINIMIZING EXOTIC PESTS		5	8	8	3	5	4	4	6
2. MINIMIZING NATIVE PESTS		5	8	8	3	5	4	4	6
3. MINIMIZING MAMMAL PESTS		5	8	8	3	5	4	4	6
4. MINIMIZING EXTREME FIRES		9	9	9	6	6	6	7	7
5. MINIMIZING OTHER "NATURAL" LOSSES		9	9	9	6	6	6	7	7
6. AVOIDING ATMOSPHERIC CO2 BUILDUP		9	6	6	6	4	5	7	5
7. CONSERVING FORESTS ABROAD		9	6	6	6	4	5	7	5
8. CONSERVING NATIVE FOREST TYPES		1	7	8	3	6	5	2	6
9. PROVIDING NATIVE SPECIES HABITATS		1	6	7	2	5	5	1	6
10. PROTECTING ENDANGERED SPECIES		5	8	8	5	6	6	5	7
11. AVOIDING INVASIVE EXOTIC SPECIES		5	8	8	5	6	6	5	7
12. MAINTAINING GENETIC DIVERSITY		6	9	9	7	9	9	6	9
13. MAINTAINING SITE QUALITY		5	8	8	5	6	6	5	7
14. SUSTAINING WATERSHEDS		5	5	5	5	5	5	5	5
15. MAINTAINING FOREST LAND BASE		6	9	9	7	9	9	6	9
16. TIMBER VOLUME		9	6	6	6	4	5	7	5
17. TIMBER QUALITY		5	8	8	3	5	4	4	6
18. SELECTED TIMBER SPECIES		9	6	6	6	4	5	7	5
19. NON-TIMBER PRODUCTS		5	8	8	3	5	4	4	6
20. RESERVE AREAS		2	2	2	5	5	5	4	4
21. REMOTE RECREATION		2	4	5	5	7	6	4	5
22. ACCESSIBLE RECREATION		5	8	8	3	5	4	4	6
23. COMMODITY-DEPENDENT LIFE STYLES		5	8	8	3	5	4	4	6
24. NON-COMMODITY LIFE STYLES		5	8	8	5	6	6	5	7
25. EMPLOYMENT & VALUE-ADDED		9	9	9	8	8	8	9	9
26. WATER VOLUMES & USEFULNESS		5	5	5	5	5	5	5	5
27. GAME & NON-GAME FISH & WILDLIFE		5	8	8	5	6	6	5	7
28. SMALL NON-INDUSTRIAL LANDOWNERS		5	5	5	3	3	3	4	4
29. PRIVATE, INDUSTRIAL LANDOWNERS		5	5	5	3	3	3	4	4
30. HIGH-VOLUME TIMBER MFG.		9	6	6	6	4	5	7	5
31. HIGH QUALITY TIMBER MFG		5	8	8	3	5	4	4	6
32. RECREATION INDUSTRY		1	7	8	3	6	5	2	6
33. LOW PUBLIC COSTS OF FOREST MGMT.		9	6	6	6	4	5	7	5
34. SCENIC & HISTORICAL VALUES		1	4	4	3	4	4	2	4
35. SPIRITUAL & CULTURAL VALUES		1	7	8	3	6	5	2	6

TABLE 1.5F. ALASKA--SUMMARY OF EFFECTS OF POLICY OPTIONS.

	POLICY OPTIONS								
	PRESENT	OPTION # 1	OPTION # 2	OPTION # 3	OPTION # 4	OPTION # 5	OPTION # 6	OPTION # 7	OPTION # 8
AREA IN EACH APPROACH									
TIMBER MANAGEMENT AREA (millions of acres)	11	15	13	5	5	5	6	6	0
INTEGRATED AREA (millions of acres)	4	0	0	10	8	6	9	5	11
NON-COMMODITY AREA (millions of acres)	6	6	8	6	8	10	6	10	10
SELECTED ECONOMIC MEASURES									
TIMBER HARVEST VOLUME (billion FT3/year)	0.2	0.4	0.3	0.3	0.3	0.2	0.3	0.3	0.2
EMPLOYMENT (thousands of people)									
FORESTRY & LOGGING	5	2	2	4	3	3	4	2	3
LUMBER & WOOD PRODUCTS	13	16	14	19	16	14	18	13	15
PAPER & ALLIED PRODUCTS	10	15	13	14	12	10	14	11	10
CARPENTERS	18	27	24	25	22	19	25	19	18
INDIRECT	47	61	53	61	54	46	61	46	46
TOTAL	93	121	106	123	107	92	122	92	92
NET TIMBER IMPORT(-) OR EXPORT (+) (billion FT3/year)	0.0	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.0
PUBLIC COST OF MANAGEMENT (billions of dollars)	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
PUBLIC RETURN FROM MANAGEMENT (billions of dollars)3	0.4	0.8	0.6	0.8	0.6	0.4	0.8	0.4	0.3
ESTIMATED RELATIVE CONTRIBUTION OF THE APPROACH TO INCREASING THE POTENTIAL AND/OR REALIZATION OF VALUES IN TABLE 1.1. (1=lowest; 10=highest)									
1. MINIMIZING EXOTIC PESTS		4	6	6	3	4	5	3	5
2. MINIMIZING NATIVE PESTS		4	6	6	3	4	5	3	5
3. MINIMIZING MAMMAL PESTS		4	6	6	3	4	5	3	5
4. MINIMIZING EXTREME FIRES		7	7	7	6	6	6	7	7
5. MINIMIZING OTHER "NATURAL" LOSSES		7	7	7	6	6	6	7	7
6. AVOIDING ATMOSPHERIC CO2 BUILDUP		7	5	5	6	5	4	7	5
7. CONSERVING FORESTS ABROAD		7	5	5	6	5	4	7	5
8. CONSERVING NATIVE FOREST TYPES		2	6	6	3	5	5	3	6
9. PROVIDING NATIVE SPECIES HABITATS		2	6	6	3	5	5	3	6
10. PROTECTING ENDANGERED SPECIES		5	7	7	5	6	6	5	7
11. AVOIDING INVASIVE EXOTIC SPECIES		5	7	7	5	6	6	5	7
12. MAINTAINING GENETIC DIVERSITY		6	9	9	7	9	9	7	9
13. MAINTAINING SITE QUALITY		5	7	7	5	6	6	5	7
14. SUSTAINING WATERSHEDS		5	5	5	5	5	5	5	5
15. MAINTAINING FOREST LAND BASE		6	9	9	7	9	9	7	9
16. TIMBER VOLUME		7	5	5	6	5	4	7	5
17. TIMBER QUALITY		4	6	6	3	4	5	3	5
18. SELECTED TIMBER SPECIES		7	5	5	6	5	4	7	5
19. NON-TIMBER PRODUCTS		4	6	6	3	4	5	3	5
20. RESERVE AREAS		4	4	4	5	5	5	4	4
21. REMOTE RECREATION		4	5	5	5	6	6	4	6
22. ACCESSIBLE RECREATION		4	6	6	3	4	5	3	5
23. COMMODITY-DEPENDENT LIFE STYLES		4	6	6	3	4	5	3	5
24. NON-COMMODITY LIFE STYLES		5	7	7	5	6	6	5	7
25. EMPLOYMENT & VALUE-ADDED		9	9	9	8	8	8	8	8
26. WATER VOLUMES & USEFULNESS		5	5	5	5	5	5	5	5
27. GAME & NON-GAME FISH & WILDLIFE		5	7	7	5	6	6	5	7
28. SMALL NON-INDUSTRIAL LANDOWNERS		4	4	4	3	3	3	3	3
29. PRIVATE, INDUSTRIAL LANDOWNERS		4	4	4	3	3	3	3	3
30. HIGH-VOLUME TIMBER MFG.		7	5	5	6	5	4	7	5
31. HIGH QUALITY TIMBER MFG		4	6	6	3	4	5	3	5
32. RECREATION INDUSTRY		2	6	6	3	5	5	3	6
33. LOW PUBLIC COSTS OF FOREST MGMT.		7	5	5	6	5	4	7	5
34. SCENIC & HISTORICAL VALUES		2	4	4	3	4	4	3	4
35. SPIRITUAL & CULTURAL VALUES		2	6	6	3	5	5	3	6

Table 1.6. Assumed effects of each approach on timber harvest, employment, costs, and other values. (These values are considered relative and for comparisons only. Explanations of origins of numbers, and alternative sources, are described in Table 1.7.)

--TIMBER HARVEST:

"Economic efficiency" approach: 75% of gross growth, by region.
"Integrated" approach: 65% of gross growth, by region.
"No commodity" approach: No timber harvest.

--U.S. CONSUMPTION OF TIMBER: 16.3 billion cubic feet/year

--EMPLOYMENT:[1] Employment is divided into "Direct" and "Indirect" categories:

DIRECT EMPLOYMENT: There are four types of direct employment.
Forest Management and Timber Harvest (Presently 129,000 people employed):
"Economic efficiency" approach: 7 people/ million cubic feet
"Integrated" approach: 14 people/million cubic feet
"No commodity" approach: 1 person/40,000 acres/year.
Lumber and Wood Products (Presently 752,000 people employed[2]):
"Economic efficiency" approach: 44 people/ million cubic feet
"Integrated" approach: 66 people/million cubic feet
"No commodity" approach: 0 people
Paper and Allied Products (Presently 691,000 people employed):
"Economic efficiency" approach: 42 people/ million cubic feet
"Integrated" approach: 42 people/million cubic feet
"No commodity" approach: 0 people
Carpenters (Presently 1,255,000 people employed):
"Economic efficiency" approach: 77 people/ million cubic feet
"Integrated" approach: 77 people/million cubic feet
"No commodity" approach: 0 people

INDIRECT EMPLOYMENT: This employment assumes one indirect job per direct job.

--MANAGEMENT COSTS (including taxes or payments in place of taxes
"Economic efficiency" approach: $20/acre/year
"Integrated" approach: $25/acre/year
"No commodity" approach: $ 15/acre/year

--STUMPAGE VALUES:
"Economic efficiency" approach: $ 1,250/thousand cubic feet
"Integrated" approach: $1,125/thousand cubic feet

--TAX RECEIPTS GENERATED: $ 1/cubic foot of timber harvested

--REDUCED GOVERNMENT COST BY EMPLOYMENT: $15,000/person/year
If employment exceeds present levels, extra employment is added as a return to government; lower employment is considered a cost to government.

[1] Employment in recreation is not considered, but may be similar under all management approaches, since much of the recreation employment is in "accessible recreation."

Table 1.7. Explanations of numbers shown in Table 1.6. Numbers shown in Table 1.6 are shown in boxes. Sources of numbers are listed below it, along with other possible numbers. As can be seen, the numbers vary by source and assumptions; however, the trends shown in this report are quite robust. Attempts were made to be conservative in estimating present condition and impacts.

--TIMBER HARVEST:

"Economic efficiency" approach: 75% of gross growth, by region.
"Integrated" approach: 65% of gross growth, by region.
"No commodity" approach: No timber harvest.

75% of gross growth is considered the maximum sustainable, because mortality of individual trees in stands which are often not economically recovered; and because some forests are inaccessible because of terrain & ownership contraints.

As of 1992 (Powell et al. 1993), the South & Pacific Coast were harvesting about 75% of their gross growth, which is probably near the maximum harvest which is economically feasible.

This study estimated a harvest of about 87% of "economic efficiency" using the "integrated management" approach. This estimate is conservative, compared to the estimates described below:

Lippke et al. (1996) showed the following average, sustainable harvest by 3 treatments:

Approach:	"Economic efficiency"	First "integrated" approach	Second"integrated" approach
thou.cubic ft./acre/yr	2,100	1,780	1,800
% of "economic efficiency"	100%	91.5%	91.6%

--U.S. CONSUMPTION OF TIMBER: 16.3 billion cubic feet/year

The United States seems to be vacillating between a net importing of timber and a balance of importing and exporting of timber. Much of the export is in pulp and paper products, while the import is largely softwood lumber, pulp, and newsprint Brooks (1995). More recent, unpublished U.S.D.A. Forest Service data estimated the United States is presently approximately balanced in import and export of forest products. Consequently, its consumption is assumed to equal its production (Powell et al. 1993).

(Continued on next page)

DIRECT EMPLOYMENT: There are four types of direct employment.
Forest Management and Timber Harvest (Presently 129,000 people employed[1]):
"Economic efficiency" approach: 7 people/ million cubic feet
"Integrated" approach: 14 people/million cubic feet
"No commodity" approach: 1 person/40,000 acres/year.[2]
Lumber and Wood Products (Presently 752,000 people employed[3]):
"Economic efficiency" approach: 44 people/ million cubic feet
"Integrated" approach: 66 people/million cubic feet
"No commodity" approach: 0 people
Paper and Allied Products (Presently 691,000 people employed):
"Economic efficiency" approach: 42 people/ million cubic feet
"Integrated" approach: 42 people/million cubic feet
"No commodity" approach: 0 people
Carpenters (Presently 1,255,000 people employed):
"Economic efficiency" approach: 77 people/ million cubic feet
"Integrated" approach: 77 people/million cubic feet
"No commodity" approach: 0 people
INDIRECT EMPLOYMENT: This employment assumes one indirect job per direct job.

Calculation of direct employment:

This estimate of direct employment was from Statistical Yearbook, 1996.

Forest Management and Timber Harvest	**129,000 people employed**
Lumber and Wood Products	**752,000 people employed**
Paper and Allied Products	**691,000 people employed**
Carpenters (Presently	**1,255,000 people employed**
Total	**2,827,000 people employed**

Estimates of direct employment per cubic feet were obtained by dividing the numbers above by the present national timber volume production for "Economic efficiency" management.

Employment in forest management and timber harvest were assumed to double under "integrated management" (based on comparisons below) and employment in lumber and wood products was assumed to increase by one third because of the higher quality timber produced through "integrated management" with more thinnings and longer rotations.

An alternative estimate of direct employment was obtained for the Inland West by personal telephone calls and Bureau of Labor Statistics,Employment, and Wages Annual Averages (1994), Keegan et al. (1996), and USDA Forest Service TSPIRS (1987). This data is as follows:

"Economic efficiency" 60,000 cubic feet to 111,110 cubic feet/person/year.
"Integrated management" 15,100 cubic feet/person/year.
"No commodity" approach: 20,000 to 65,000 acres/person/year.

(Continued on next page)

[1] Data from Statistical Yearbook, U.S.Dept. of Interior, 1996. (Different sources of data may give varying results.)
[2] Values based on information from Inland West and Pacific Northwest public lands.
[3] This assumes slightly more value added employment with integrated management.

Another alternative estimate of direct employment by management approach was obtained from Lippke et al. (1996) for western Wshingon:

"Economic efficiency"	**5 people/acre/year**
"Integrated management"	**8 people/acre/year**

Another estimate of direct employment in forestry and forest products is from the American Forest and Paper Association (1990), from data maintained by the U.S.Dept. of Commerce.

Forestry employment	**59,100 people**
Paper employment	**701,800 people**
Lumber employment	**852,200 people**
Total	**1,613,100 people**

Another estimate of total direct employment (not including carpenters and less direct manufacturing) for the Inland West is from Oliver and Lippke (1994):

"Economic efficiency":	**45 people/ million cubic feet/year**
"Integrated management":	**40 people/million cubic feet/year**

<u>Estimates of indirect employment for direct employment are:</u>

For Pacific Northwest (Conway; 1994):
5 indirect jobs per direct job
For South (Cubbage and Aruna 1996):
1.5 to 2 indirect jobs per direct job

Because some of the indirect jobs would be maintained if the United States imported its timber and/or various manufactured wood products or used substitute products, this report assumes one indirect job per direct job is impacted in forestry.

--MANAGEMENT COSTS (including taxes or payments in place of taxes

"Economic efficiency" approach:	**$20/acre/year**
"Integrated" approach:	**$25/acre/year**
"No commodity" approach:	**$ 15/acre/year**

From Oliver & Lippke

	Timber mgmt	**Integrated mgmt**
Costs (excluding payments in place of taxes.)	**$ 4.81/acre/yr.**	**$ 8.94/acre/yr**
Payments in place of taxes $ 15.42.		

USDA Forest Service Wilderness staff budget is currently approximately $1/acre/year, but does not include payments in place of taxes, fire fighting, or possibly recreation and wildlife budgets. Also, these Wilderness Areas contain large areas of rock and ice (unproductive forests or non-forested).

(Table 1.7, continued on next page)

--STUMPAGE VALUES:

"Economic efficiency" approach: $ 1,250/thousand cubic feet

"Integrated" approach: $1,125/thousand cubic feet

Estimates of stumpage vlues from Oliver & Lippke (1994) for the Inland West:

		Timber mgmt	Integrated mgmt
Stumpage values		**$ 536/thousand cubic feet**	**$ 425/thousnd cubic feet**
	or	**$ 1,072/thousand cubic feet**	

Estimates of stumpage values from Lippke et al. (1996) for western Washington:

	Timber mgmt	Integrated mgmt
thinnings		**$ 1,400/thousand cubic feet**
final harvest	**$ 1,950/thousand cubic feet**	**$ 2,300/thousand cubic feet**
av:	**$ 1,950/thousand cubic feet**	**$ 2,000/thousand cubic feet**

("Integrated management" removes more wood in final harvest than in thinnings)

--TAX RECEIPTS GENERATED: $ 1/cubic foot of timber harvested

From Lippke et al.(1996) for Washington State: $ 180,000/200,000 cubic feet harvested) These include federal and state tax receipts from total economic activity generated. Thinning actually generated much higher tax receipts, according to the calculations.

--REDUCED GOVERNMENT COST BY EMPLOYMENT: $15,000/person/year

From Lippke et al. (1996)

If employment exceeds present levels, extra employment is added as a return to government; lower employment is considered a cost to government.